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BALLY MANUFACTURING CORPORATION,
a Delaware corporation,

Plaintiff/Counterdefendant,

vs.

D. GOTTLIEB & CO., a corporation,

WILLIAMS ELECTRONICS, INC., a

corporation, and ROCKWELL INTERNATIONAL

CORPORATION,

Defendants/Counterplaintiffs.)

) Docket No.

) 78 C 2246

) Chicago, Illinois

) March 14, 1984

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VOLUME XIII-A

TRANSCRIPT OF PROCEEDINGS

BEFORE THE HONORABLE JOHN F. GRADY

TRANSCRIPT ORDERED BY: MR. JEROLD B. SCHNAYER
MR. MELVIN M. GOLDENBERG

APPEARANCES:

For the Plaintiff/
Counterdefendant:

MR. KATZ
MR. TONE
MR. MATHIAS
MR. SCHNAYER
MS. SIGEL
MR. BURNS

For the Defendants/
Counterplaintiffs:

MR. GOLDENBERG
MR. RIFKIN
MR. ELLIOTT
MR. LYNCH
MR. HARDING
MR. GOTTLIEB

Court Reporter:

LAURA M. BRENNAN
219 South Dearborn Street, Room 1918
Chicago, Illinois 60604

DOCKETED

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THE CLERK: 78 C 2246, Bally Manufacturing versus
Gottlieb, case on trial.

THE COURT: Good morning, counsel.

MR. TONE: Good morning, your Honor.

MR. LYNCH: Good morning, your Honor.

THE COURT: Before we get started, let me say that I
decided, as far as Mr. Katz' situation was concerned, that
we were just not going to take another recess.

We've given one continuing legal education break
to each side, or at least an extracurricular break to each
side; one to Mr. Tone and one to Mr. Goldenberg. So that's
even up. And from now on we keep going until we finish.
Okay.

Now, where were we?

MR. LYNCH: We were cross-examining Dr. Schoeffler.

THE COURT: Dr. Schoeffler, will you resume the stand,
please.

DR. JAMES SCHOEFFLER, Plaintiff's witness, previously
sworn

CROSS EXAMINATION (Resumed)

MR. LYNCH: If I may, your Honor, I would like
to mark some of these charts that --

THE COURT: All right.

MR. LYNCH: -- that had been manufactured, or
that I prepared during the last session.

1 THE COURT: All right.

2 MR. LYNCH: I'd like to mark as Exhibit 20-A --
3 It's a series of Exhibit 20, a series of charts on noise
4 technique.

5 BY MR. LYNCH:

6 Q You will recall, Dr. Schoeffler, these noise
7 techniques corresponded to those you articulated in the
8 patent. Do you recall that?

9 A Yes.

10 Q And these are your comments with respect to them,
11 including the claims that specifically addressed those
12 various topics.

13 A Yes, sir.

14 MR. LYNCH: I will mark those, your Honor, as
15 20-A, that is, the chart with noise techniques 1,
16 2 and 3; 20-B, the sheet referring to noise tech-
17 niques 4, 5, 6 and 7; 20-C as the one referring to
18 noise techniques 8, 9 and 10, as outlined in the patent
19 by Dr. Schoeffler; 20-D, that page referring to tech-
20 niques 11, 12, 13, 14 and 15 in the 441 patent; and
21 as 20-E, noise techniques which were articulated as
22 being software techniques 16, 17, 18, 19 and 20.

23 BY MR. LYNCH:

24 Q I don't believe that you'll find those colored
25 in the patent, but you did testify about them, correct,

1 Doctor Schoeffler?

2 A That is correct.

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9 That is correct, that is correct.

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1 Q I would then like to mark as Exhibit 19-E -- I am sorry --
2 19-F, your Honor, a chart that referred to Plaintiff's Exhibit
3 430.

4 430, you will recall, Dr. Schoeffler, was the Bally
5 Electronics Games' Theory of Operation manual?

6 A Yes, Sir.

7 Q -- We articulated for noise fixes that are referred to in
8 there, correct?

9 A That were listed in there, that is correct.

10 Q None of them appear either in the Flicker Game or the '441
11 patent, correct?

12 A That is correct.

13 Q That is 19-F.

14 19-G, then we had a discussion about the error
15 recovery aspects of the alleged invention of the '441 patent,
16 correct?

17 A We had a discussion, that is correct.

18 Q I prepared this chart, 19-G, at that time?

19 A Yes, sir.

20 Q We had then a discussion about the real time other than
21 error recovery aspects, and I will call that 19-H.

22 Do you recall that testimony, Dr. Schoeffler?

23 A Yes, sir.

24 Q And at 19-I, a chart prepared referring to the matrix
25 multiplexing aspects of the alleged invention of the '441

1 patent, do you recall me preparing this, Dr. Schoeffler?

2 A. Yes, I do.

3 Q. Let us get to this one, Dr. Schoeffler, because it raises
4 a matter that perhaps we can address that was investigated
5 during the break.

6 In your testimony you indicated that in connection
7 with the matrix multiplexing aspect of the patent, there was a
8 slow turn-on transistor?

9 A. Transistors.

10 Q. Transistors, and those resulted in a rise time of 5 micro-
11 seconds in the Flicker Game?

12 A. What I testified was that in looking up those transistors
13 in the transistor manual, the turn-on time -- is what it is
14 called -- is listed as 2 and a half microseconds typically for
15 those transistors, which means that in the actual circuit, it
16 could be anywhere from there to around this time.

17 Q. The 5 microseconds was your estimate, correct, Doctor?

18 A. 2 and a half microseconds is the value of the parameter.
19 So in the circuit, it would be that or perhaps longer than that.

20 Actually, 5 microseconds is probably closer to the
21 turn-off time rather than the turn-on time. 2 and a half
22 microseconds would be a more reasonable number since that is
23 listed in the transistor manuals.

24 Q. Now, did you have an opportunity to test the Flicker
25 machine for such rise time?

1 A. The only testing of the Flicker machine that I did was
2 when Dr. Vacroux put an oscilloscope on the machine in the
3 other room here.

4 Q Did you ascertain what the rise time was at that time, or
5 did you not?

6 A. At that time the 2 measurements were made, they were
7 extremely awkward measurements and difficult ones, and it was
8 not clear precisely what was being measured.

9 In particular, the current, which is the important
10 thing, was not being measured, but the voltage. However, in
11 the first measurement, the order of magnitude that was
12 measured was on the order of 2 microseconds for a portion of
13 the rise time. So it was consistent with the transistor
14 parameter.

15 Q 2 microseconds?

16 A. That is the number that was recorded for a portion of the
17 rise time.

18 The measurement was too difficult to be very precise
19 beyond that.

20 Q Now, what we are talking about here is in each of the
21 strobe cycles that the microprocessor goes through, there is
22 a time period of 10.8 microseconds, correct, 10.8 microseconds
23 for each instruction, correct?

24 A. That is one cycle in the 4004 microprocessor. So many
25 instructions are executed in one cycle.

1 Q Now, you are indicating that a rise time of one fifth of
2 that value will have a significant effect on the operation of
3 a game such as the Flicker game?

4 A What I testified was that one of the noise prevention
5 techniques that was disclosed by Frederiksen in the patent and
6 implemented in the Flicker was the use of these transistors.

7 What I testified was that a rise time of 2 and a
8 half microseconds to 5 microseconds in that range compared to
9 the rise time of a non-slow turn-on transistor is about 25 to
10 1.

11 As it turns out, the noise that is generated due to
12 a rapidly changing pulse is inversely proportional to that.
13 And, as a consequence, the use of a slow turn-on transistor
14 instead of a fast one is about a 25 to 1 reduction in the
15 frequency components of the noise that affect the rest of the
16 system.

17 As indicated in the patent, that does have an effect.

18 Q Doctor, let's talk about another aspect of the Flicker
19 machine. Let's talk about the isolation diodes on the play-
20 field.

21 Now, do you recall, Doctor, that we talked about
22 Defendants' Exhibit 11-E, particularly, the switch matrix at
23 the bottom?

24 A Yes, sir.

25

1 Q Do you recall, we talked about these diodes affiliated
2 with each switch in that diagram?

3 A I do.

4 Q And those are isolation diodes, are they not?

5 A Steering diodes, I think is the term, to prevent sneak
6 paths.

7 Q Now, to prevent the sneak paths in a switch matrix such
8 as shown in 11-E, there must be such a diode affiliated with
9 each switch. Is that correct?

10 A If a sneak path can actually exist, then diodes are
11 necessary.

12 Where sneak paths do not exist, or cannot exist,
13 then of course the diodes are not needed.

14 Q What is your testimony as to whether such diodes are
15 included on the Flicker game?

16 A In the switch matrix in the Flicker game there are diodes
17 on some of the switches. Notably the operator adjustable
18 switches and some diodes in the playfield switches at the top
19 of the diagram in the Flicker machine.

20 Q Now, the operator adjustable switches, are they operated
21 by the software in the Flicker machine?

22 A The operator adjustable switches are plug connections
23 that one uses to set up the game. They are in the switch
24 matrix. So whether they are operated by the -- well, in fact,
25 let me back up a little bit.

1 No switch is operated by the software, sir. That is,
2 switches are simply read by the software. And so they are
3 read just as much as any other switch, because they are in
4 the same matrix.

5 Q I understand that. But in the software arrangement of
6 the Flicker game are those operator adjustable switches
7 accounted for in the software?

8 A In the -- what do you mean by accounted for in the
9 software? They are in the --

10 Q Is the operation of those switches -- is there provision
11 in the software made for the operation of those switches the
12 way those switches are intended to operate in the field?

13 A In the software in the Flicker game those switches are
14 all in the matrix. And in the program the matrix is scanned
15 through column by column, including those columns; and as
16 a consequence, the multiplexing routine and the switch reading
17 routine is there.

18 Q Certain of the functions that are available on the
19 operator setup machine have not been implemented in the soft-
20 ware; others have.

21 Q When we talk about the software, that entire left-hand
22 portion of the switch matrix is shown in the mux charts, which
23 is Plaintiff's -- the figure 4 in the patent.

24 A Yes.

25 Q Isn't it the case, Doctor, that the Flicker game will not

1 change its mode of operation based upon what switches on the
2 left-hand side of the mux chart, that is, these 110-K through
3 30-K switches, it will not change its operation based on how
4 they are hooked up, correct?

5 A. Those switches are for the purposes of setting bonus
6 levels, et cetera. And the software does not respond to
7 those, the way it is programmed at the moment.

8 Q. And so for practical purposes, as far as those switches
9 are concerned, it's like they are not there, as far as the
10 software is concerned. Correct?

11 A. That is not correct.

12 Q. As the program reads through, okay, it attempts to
13 read -- it reads the switch input line there, and it will not
14 change the operation of the game, is the only point.

15 Q. You say it reads it but it doesn't do anything about it.

16 A. That's correct.

17 Q. Now, are those the switches, these on the left-hand side,
18 that are provided with the diodes?

19 A. That is absolutely correct.
20 isolation diodes in connection with the switches on
21 the left side.

22 A. Each of the diodes' games has a switch on the left side
23 field for the game, it is disclosed in the patent.

24 Q. And said by you, Mr. Schoeffler, that the switch on the
25 A. That I mean was part of the circuit. But a switch in

Schoeffler - cross

ct

1 Q Now, how about these switches on this side of the play-
2 field, on the right side, the switches that have to do with
3 the playfield action?

4 A The switches on the right-hand side of the matrix that
5 correspond to switches in the playfield do not have individ-
6 ual diodes in series with each switch for steering purposes.
7 Rather, each group of 4 in the columns has a single
8 diode.

9 Q Now, you do recall the arrangement of the Bally games,
10 do you not?

11 A Yes, sir.

12 Q Do those Bally games have isolation diodes on each of
13 the switches?

14 A Yes, sir, they do.

15 Q On the playfield?

16 A Yes, sir.

17 Q They do?

18 A They do.

19 Q How about the Gottlieb games, does that game have
20 isolation diodes in connection with each of the switches on
21 the playfield?

22 A Each of the defendants' games has switches on the play-
23 field for all those, as is disclosed in the patent.

24 Q You said switches, Mr. Schoeffler. Do you mean diodes?

25 A What I meant was, each of the switches has a diode in

2,2

1 each of those games, as is disclosed in the patent.

2 Q Let's just pursue that a moment, Dr. Schoeffler. We'll
3 go back to Fig. 5 of the patent.

4 I believe you identified those isolation diodes as
5 98, correct?

6 A That is correct, sir. That is a representative diode,
7 and is so indicated in the text of the patent.

8 Q And there is in fact a diode in the Flicker machine in
9 that position, is there not?

10 A No, that is not correct, sir.

11 The diode on the Flicker machine is in the columns
12 of the matrix.

13 That switch is in a row of the matrix, and it's
14 shown one for each switch in that row. If it were in the
15 column, it would have to be drawn differently.

16 Q So then are you telling me that this diagram, does this
17 conform to the Flicker machine or does it not?

18 A This shows more diodes than are in the Flicker machine.

19 What it teaches is that if you need -- have sneak
20 paths -- notice the way it is drawn with all the switches
21 apparently present in a very general scheme -- that you should
22 put diodes in series with all of the switches, is what that
23 teaches.

24 In the Flicker machine it wasn't necessary apparent-
25 ly to do this, in Frederiksen's analysis, and so he did not.

1 But he did indicate that it should be done when it
2 was necessary, and was done in the machine where it was
3 necessary.

4 Q Now, Doctor, he never showed diodes on each of the
5 switches.

6 A He discloses diodes on each of the switches right there
7 in the patent, and in the text of the patent.

8 Q 98.

9 A If you read in the patent where it says 98, it says
10 these are representative.

11 And the way this is drawn, in series with each of
12 those, that's the only way an electronic engineer of the day
13 would interpret that. Steering diodes were known at the time
14 this was produced.

15 Q So it's your testimony, Doctor, that, for example, the
16 diodes appearing in Exhibit 52 at P-4 of the playfield, are
17 those the diodes 98 shown on Fig. 5?

18 A Those are not, sir.

19 Q Where are these shown on Fig. 5?

20 A These diodes are not shown on Fig. 5.

21 Fig. 5 shows the general case where you put the
22 diode in series with each switch.

23 What was done in Flicker, because of his arrange-
24 ment of switches on the right-hand side of the matrix, and
25 the fact that they couldn't close and produce sneak paths, he

4
1 did not need diodes for sneak paths through the switches.

2 Q Those diodes prevent sneak paths, however, through
3 the lamp circuits.

4 Q Let's talk about the switches so the Court understands
5 what the sneak path is.

6 Q If on Exhibit 13 the switch I've indicated as 1
7 is closed as a valid closure --

8 A Yes, sir.

9 Q If Switch 2 is stuck, and if Switch 3 is an outhole
10 switch or some switch in which the ball is residing, what will
11 happen?

12 A If you are referring to --

13 Q Without the diodes present.

14 A If you are referring to the Flicker game, the combina-
15 tion of the switch numbered 13 and the switch numbered 22
16 being closed at the same time should not occur.

17 Q With 12 being stuck at the same time.

18 A Yes.

19 In the Flicker game the only switches that can be
20 active are in the right-hand part here. And as Frederiksen
21 testified, that normally they do not close simultaneously.

22 Q I understand that. Just so we understand what the sneak
23 path is, if Switch 13 that I've marked 1 is closed --

24 A Um-hum.

25 Q -- Switch 12, which I've marked 2 is stuck closed --

1 A. Um-hum. It would be a break path. That's what you're

2 Q. -- and Switch 3 is also closed, what happens?

3 A. Not referring to the Flicker, because it doesn't occur
4 there readily, but in general if one has no diodes in the
5 matrix and multiple switches like that in that shape of an
6 L as you have indicated, one could misread an open switch to
7 a closed switch on the bottom line there. The effect of
8 the closure of that switch may make the data operate spe-
9 cifically, it may be something that needs correction. But
10 in general, there is an error in reading that switch.

11 A. Now, with respect to switches, your testimony earlier
12 was that your location of error in connection with each switch
13 are necessary.

14 A. My testimony was that, the necessary error paths can
15 arise.

16 A. And in the exhibit, where you've described the
17 general way to do this, they are shown.

18 A. Now, my testimony also was that, in the case of the
19 flicker machine on the right, it was Kreder's judgment
20 that the error paths would not occur, and therefore the
21 switches were not faulty.

22 A. And that, furthermore, if he thought that they would
23 occur, it would have been easy to modify the placement in the
24 matrix, he could have moved it, or he could have added
25 a diode to the circuit, because he did put them in on

1 Q And there would be a sneak path. That's what you're
2 referring to as a sneak path, correct, Doctor?

3 A Yes. A sneak path results in reading a switch that is
4 open as though it were closed. And so it would be an error
5 then as far as the operation of the game were concerned.

6 Q And the game would not be functioning properly, correct?

7 A That switch would be read erroneously. The effect of
8 the closure of that switch may make the game operate in-
9 effectively, it may be something that goes unnoticed. But
10 in general that is an error in reading that switch.

11 Q Now, with respect to switches, your testimony earlier
12 was that such isolation diodes in connection with each switch
13 are necessary.

14 A My testimony was they are necessary when sneak paths can
15 arise.

16 Q And in the patent, where you're describing the
17 general way to do this, they are shown.

18 A Now, my testimony also was that, in the case of the
19 Flicker machine on the right, it was Frederiksen's judgment
20 that the sneak paths could not occur, and therefore the
21 switches were not empty.

22 Q And that, furthermore, if he thought that they would
23 occur, it would have been easy to modify the placement in the
24 matrix, because there's plenty of space to do it; or he could
25 have put in the diodes himself, because he did put them in on

1 the other switches.

2 Q The fact of the matter is, is that those diodes are
3 not present on any switches that are software operated in the
4 Flicker, correct?

5 A No switch is software operated, sir. They are read by
6 the software.

7 Q There is no -- let me put it this way: There are not
8 those isolation diodes associated with the individual switches
9 that make a difference in the operation of Flicker.

10 A That is not correct, sir.

11 There are diodes on the parameter adjustable
12 switches that are implemented and that do make a difference,
13 namely that 5-ball switch in that column about the matching
14 straight.

15 And that is why Frederiksen put them there, because
16 if the operator closes those, those are closed all the time.
17 And consequently it would be possible to have a problem with
18 those switches.

19 Q You say it is implemented on one switch, the 5-ball
20 straight switch?

21 A Yes, sir. Let me get the schematic out.

22 Did you want me to point those out to you, sir?

23 Q Yes. I want you to point out over here, which switches
24 on the mux chart.

25 A I'm looking here on Plaintiff's Exhibit 52, which is the

1 schematic for the Flicker game.

2 And you'll notice that on that exhibit, in the
3 upper left-hand corner where it shows the connection for
4 the 5-ball, it shows a diode in the line going to mux 9,
5 which is the column that the 5-ball switch is in.
6 You will also notice diodes in the extra ball,
7 jumper, straight, add-a-ball, replay match circuitry, which is
8 just below that on that same exhibit, sir.

9 Q But the operator adjustable switch is here.

10 A Those switches are implemented by -- if you recall
11 looking at the board, there are some wires, colored wires,
12 yellow, red and I've forgotten the other colors, sticking up
13 in the air.

14 Underneath there there is a diode in each of those
15 wires. So if any one of those was plugged in, there would be
16 a diode in every single circuit of those adjustable switches,
17 as Frederiksen taught in the patent.

18 See, those could contribute significantly to sneak
19 paths.

20 Q Well, now, Frederiksen never mentioned sneak paths in
21 the patent, does he?

22 A Frederiksen mentioned the steering diodes in the text
23 and showed them on the diagram. That's inherent in the patent.

24 Q Frederiksen never mentioned sneak paths in the patent.

25 A The word sneak path does not appear in the patent.

1 But the disclosure of the steering diodes is very
2 clear in the patent.

3 Q Now, you just referred to Exhibit 52, and in referring
4 to the match, replay, add-a-ball, and straight, you talked
5 about switches, didn't you?

6 A That's a selection that is implemented with a plug-in
7 switch.

8 Q Are they switches?

9 A Yes. It's a connection that one plugs onto the columns
10 there on the back of the board, sir.

11 Q It is a wire one takes off one location and places in
12 another location, correct?

13 A To complete an electrical circuit, that is the defini-
14 tion of a switch.

15 Q It is not a switch in the same context of the switch
16 that can be opened and closed rapidly by activation, correct?

17 A Parameter adjustable switches are never designed to be
18 rapidly and continuously changed.

19 They are designed to be set up to specify how the
20 game is going to play, and that stays there all the time.

21 So one would not implement that in a pinball game
22 where economics are important with an expensive mechanical
23 switch.

24 Q Mr. Frederiksen testified at 494:

25 "In the full schematic there is a diode

1 attached with each switch" -- referring to the Flicker
2 game --

3 "and there is a diode similar to 98 that would be on the
4 short wire going over to the columns, which in this
5 particular drawing there was no real room to include."

6 Now, your testimony is, that is not true with
7 respect to the playfield switches. Correct?

8 A. My testimony is that, as shown on the Flicker schematic,
9 this is correct as best I can determine; that is, the diodes
10 that are here are exactly what are underneath that playfield.

11 Q. So you're saying that Exhibit 52 is correct.

12 A. Yes, sir, that those diodes are all present. Because
13 if the switches fail -- they do not fail closed, it
14 is very unlikely that. Consequently, he did not need diodes
15 to cause a problem he did not consider real.

16 Let's talk about that they do not fail closed.

17 There are a bunch of roller switches up here
18 in the Flicker game. Do you remember those?

19 A. Yes, sir.

20 How do they fail, closed or open?

21 I think roller switches --

22 Let me change my response, if I may, sir. I do not
23 know how they fail. My only knowledge --

24

25 My only knowledge of how the switches fail is based

1,1

1 Q Those diodes are, but there are not diodes in connection
2 with each playfield switch?

3 A There are not diodes in connection with each playfield
4 switch. The diodes shown on this exhibit are correct.

5 Q Sneak paths could exist as I have illustrated on 11-3 on
6 the playfield?

7 A That I do not agree with, sir, that if one were to
8 deliberately take the glass off the Flicker machine and hold
9 several switches closed, you could create a sneak path. But
10 as Frederiksen indicated, because of the concurrency of those
11 switches, the fact that the spinner switch is in a column by
12 itself precludes it being included in a sneak path. Because
13 of the way the switches fail -- they do not fail closed, it is
14 a very unlikely thing. Consequently, he did not need diodes
15 to solve a problem he did not consider real.

16 Q Let's talk about that they do not fail closed.

17 A There are a bunch of roll-over switches up here
18 on the Flicker game. Do you remember these?

19 A Yes, sir.

20 Q How do they fail, closed or open?

21 A The roll-over switches --

22 Q Let me change my response, if I may, sir. I do not
23 personally know how that would close. My only knowledge -- or
24 how it would fail.

25 A My only knowledge of how the switches fail is based

1 on Frederiksen's testimony, and apparently he had experience
2 with the vertical switches only, which were the only ones he
3 has mentioned as not likely to fail closed.

4 He did not mention the other. So I assume they
5 could fail closed, but I do not know myself.

6 Q So all of these switches, which the ball runs over, at
7 least it is your tentative opinion, could fail closed, correct?

8 A Yes, sir.

9 Q If they failed closed, they could create a sneak path,
10 correct? They could create a sneak path, Doctor, correct?

11 A Only if you had at least 2 failures in the system.

12 Error recovery in a game like the Flicker does not
13 require it to have the same level of error recovery as the
14 NASA shuttle, but you would have to have at least 2 switches
15 fail in order to have a sneak path in that game over there, as
16 I read this diagram.

17 Q That is right. With that failure, you have a sneak path,
18 and that could be remedied with diodes, correct?

19 A If he had put diodes in those switches, then no sneak
20 paths would have been possible.

21 Q Bally put diodes on those switches, correct?

22 A They did, and so could Frederiksen if he had thought it
23 was a problem.

24 Q All right. Let's talk about Exhibit 52 otherwise,
25 Doctor.

1 In Exhibit 52 there is something that mystifies me,
2 Doctor.

3 Q. You said the exhibit was correct, and are you per-
4 suaded it is correct in all aspects in the way it reflects
5 the Flicker game?

6 A. There is a -- something not shown on this exhibit, this
7 wiring diagram, that is on the solenoid that pulls in the
8 flippers. There is a fast closure circuit that is not shown
9 here. That has nothing to do with the invention, but that is
10 different here.

11 Q. Let me just look this over again to see if anything
12 else -- it is the plug that goes down on the playfield, that
13 is correct, or of the plug.

14 Q. The line that goes through terminal 1
15 to terminal 2 on P2.

16 A. That is what it says in the diagram, yes.

17 Q. What happens?

18 A. I did not trace the wires on the board. I was afraid of
19 shorting and burning the machine.

20 Q. I have seen that on 2, 3, 4, 5, 6, 7, 8 of the
21 diagram, which go to P2, correct?

22 A. That is right, and they connect to the plug that
23 -- there are 8 contacts, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

24 Q. Correct.

25 A. Yes, that is correct. I am not sure if the machine is

1 Q Let me call your attention --

2 MR. SCHNAYER: You interrupted him. He was answering a
3 question of yours.

4 BY THE WITNESS:

5 A (Continuing) I was just going to scan quickly to see if
6 anything else comes to mind.

7 That fast pull-in circuit is the only one that
8 comes to mind.

9 Q Just so we can understand how to read this --

10 A Yes, sir.

11 Q P4 is the playfield plug, correct?

12 A That is the plug that goes down to the playfield, that
13 is correct, one of the plugs.

14 Q It indicates that mux line zero goes through terminal 1
15 to terminal 2 on P2.

16 A That is what it says on the diagram, sir.

17 Q Is that what happens?

18 A I did not trace the wires on the board. I was afraid of
19 stopping and hurting the machine.

20 Q It also shows that plugs 2, 3, 4, 5, 6, 7, 8 of the
21 playfield inputs go to plug P2, correct?

22 A That is right, and they connect there to Mux zero through
23 -- there are 7 of them. So that would be Mux zero through 6.

24 Q Correct.

25 A And Mux zero through 6 are the columns of the matrix.

2,2

1 Q. Mux zero through 6 are columns of the matrix. So one
2 would indicate that these wires go up here, correct?

3 A. That is what this diagram says. I did not trace them,
4 though, sir.

5 Q. But what I want to point out to you is down in Plug No. 1,
6 there is this transistor. You call this the slow turn-on or
7 the low Beta transistor.

8 A. No. That is the slow turn-on transistor. It also happens
9 to be low Beta.

10 Q. The slow turn-on transistor, from this location, drives
11 the lamps, correct?

12 A. That is correct.

13 At the top of that transistor, it is labelled Mux
14 zero to F, and those are the drives for the columns of the
15 matrix, that is correct.

16 Q. It says, "Mux drive zero down through F," correct?

17 A. That is correct, and the title, Mux drive, on the left
18 is the same one that is used on the CPU schematic to indicate
19 the output of the decoder.

20 So those are consistent names. Mux drive is
21 different from Mux zero to F.

22 Q. Now, the lamps and the digits are then driven through
23 the slow turn-on transistor, correct?

24 A. It is my understanding that the lamps and the digits
25 and the columns, also, of the switch matrix go through that

1 transistor, sir.
2 Q I know, but this diagram does not show them going through
3 that transistor, does it?
4 A This diagram does not show anything going through that
5 transistor.

6 If you will notice, there is nothing connected to
7 the top but a label Mux zero to F -- there are no lines
8 coming out of it. But wherever something attaches to it, as
9 you indicate Mux A, Mux B, Mux 1, et cetera, to indicate an
10 implied connection.
11 If this drawing is correct as to the actual wiring,
12 the upper left on the P2, it has a consistent designation
13 there, also, Mux zero through Mux F.

14 Q Now, have you traced the diagram, the wires here?

15 A No, sir. I did not trace the diagram or the wires.

16 Q Do you know whether or not there were jumper wires
17 going from here to P2?

18 A No, sir. I did not.

19 Q In this typical arrangement -- that on the Flicker

20 A Yes.

21 Q -- as reflected by 52, couldn't this arrangement also
22 indicate a machine that had 2 matrices, one for the switches
23 and one for the lamps and digits?

24 A How do you draw that conclusion, sir?

25

1 with Q If we have one driver here, if the digits are
2 driven off a decoder through P2 and from the decoder signal
3 without being driven by the slow turn-on transistor?

4 A It would be feasible to build such a machine, but the
5 way this diagram is drawn is at most ambiguous.

6 Well, We know from the software in the machine that
7 there is only a single matrix because there is in the key
8 loop that enables the columns for the lamps, the digits and
9 the switches, there is only one decoder enabling one column.

10 A No, so the answer is there are not two matrices in
11 this case. In drawing these connections together, remember,

12 Q My point is this diagram is ambiguous as to the exist-
13 ence of one or two matrices, correct? Insert the wires, and

14 A No. The only thing that is ambiguous is the fact that
15 those lines are shown connected up here on the plug.

16 They are correctly labeled for a single matrix system.

17 at this Mux zero is the proper label for the connection
18 for those switch lines. P2 are shown coming out from the

19 Q So then is it your testimony that on the Flicker
20 machine, the collector of the low data transistor is con-
21 nected to the left-hand side of plug T2?

22 A Unfortunately, I did not trace the wires for fear of
23 loosening them, and all I can testify is that the labeling
24 is correct. They should be wired that way so that they go
25 through in a single matrix, and that is totally consistent

1 with the operation of the program and no other operation, no
2 other connection, is consistent with the operation of the
3 computer program.

4 So in my opinion, I cannot see how it could be
5 done any other way.

6 Q Well, suffice it to say, if there were jumper wires
7 going up from the right-hand side of P1 to the right-hand
8 side of P2, wouldn't that be an unusual way to wire the
9 machine?

10 A No, sir.

11 In bringing these connections together, remember,
12 for this we have lamps, digits, and switches all in the
13 machine. We need lots of places to connect the wires, and
14 so that is just the sort of thing someone who is wiring the
15 machine might have done for convenience.

16 Q Well, I ask you to consider this because I have looked
17 at this diagram a great deal.

18 The arrows on P2 are shown coming out from the
19 logic board, correct?

20 A They are, sir.

21 Q Is that correct?

22 A I have no idea. I did not trace the wires on those
23 boards for fear of loosening them. So I do not know whether
24 those wires are even there or whether anything is even con-
25 nected to that plug P-2.

1 All I know is that on this diagram the labeling
2 is consistent, but the actual operation of the machine is
3 determined by the software.

4 Q Dr. Schoeffler, did you find in your inspection of the
5 Flicker machine any cut wires in the back?

6 A In looking at the driver board, there is a resistor
7 that I associated with that fast pull-up circuit for the
8 flipper solenoid that has been cut. That is the only one
9 I noticed.

10 Q That is the only wire you saw cut in the back of the
11 Flicker machine?

12 A That is the only one I noticed cut, yes, sir.

13 Q Well, would you come back with me? Let me ask you
14 about certain wires back there.

15 I have a picture of the -- you might have to in-
16 spect it yourself.

17 MR. SCHNAYER: Has that been marked as an exhibit?

18 MR. LYNCH: No.

19 Can we get in the back of the machine?

20 MR. SCHNAYER: I think the --

21 MR. GOLDENBERG: Marty has the key.

22 THE COURT: The key to what, the machine?

23 MR. SCHNAYER: The back box of the machine.

24 MR. TONE: The key was delivered to the clerk,
25 your Honor.

1 MR. SIEGEL: It is apparently in Marty's front
2 drawer. I saw him take it out. *as with your testimony,*

3 MR. LYNCH: We can handle it later then. Maybe
4 I can handle it over the break. *ordinary skills in the pin-*
5 *ball art and not of ordinary skill in the digital electronics*
6 *art, do you recall that?*

7 A Yes, sir. I do.

8 Q You referred to Mr. Norm Clark as a man of ordinary
9 skill in the pinball art, correct?

10 A Yes, sir.

11 Q You said he was a man of electromechanical abilities,
12 an electromechanical logic engineer, right?

13 A Yes, sir.

14 Q He would not understand very much about software,
15 being able to read software, would he?

16 A Software, reading software?

17 Q Reading software listings.

18 A I considered it unlikely that the average person with
19 his background would have been familiar with computer soft-
20 ware, yes, that is correct, sir.

21 Q Now, would he have been a person who would have appre-
22 ciated to your point of view all of this referred and in-
23 herent disclosure of the ball patent?

24 (Brief Interruption)

1 BY MR. LYNCH:

2 Q Let me ask you this in connection with your testimony,
3 Dr. Schoeffler. You have used the term, digital logic de-
4 sign, for, You discussed men of ordinary skill in the pin-
5 ball art and men of ordinary skill in the digital electronics
6 art, do you recall that?

7 A Yes, sir. I do.

8 Q You referred to Mr. Norm Clark as a man of ordinary
9 skill in the pinball art, correct?

10 A Yes, sir.

11 Q You said he was a man of electromechanical abilities,
12 and electromechanical logic engineer, right?

13 A Yes, sir.

14 Q He would not understand very much about software,
15 being able to read software, would he?

16 A Software, reading software?

17 Q Reading software listings.

18 A I considered it unlikely that the average person with
19 his background would have been familiar with computer soft-
20 ware, yes, that is correct, sir.

21 Q Now, would he have been a person who would have appre-
22 ciated to your point of view all of this inferred and in-
23 herent disclosure of the 441 patent?

24 A (Brier interruption) No, but he first must learn some
25 electronics.

1 BY THE WITNESS:

2 A If you are referring to the kind of engineer who
3 is not the kind we have used the term, digital logic de-
4 signer, for, but one that had been designing electro-
5 mechanical kinds of things without electronics of any type
6 up until that time, he would not be familiar with computer
7 programming.

8 And, in particular, he would be less aware, less
9 appreciative, then of the problems of making a device as
10 complicated as a microprocessor controlled pinball machine
11 operate in the noisy environment in which it operates.

12 Q So it is your testimony, and you will agree with me,
13 that Mr. Clark is not the person that could have read the
14 Frederiksen disclosure and understood all these inferred
15 and inherent matters that you have testified about, correct?

16 A I have to qualify that. I am not actually certain
17 other than what Mr. Clark said in court about his back-
18 ground, but I would agree with that, for the typical engin-
19 eer who had no exposure to microprocessors and electronics.

20 The typical -- if such an engineer had moved into
21 the electronics field and learned the microprocessor art,
22 then coupled with his background in the pinball art, he would
23 have been able to read the patent and learned how to build
24 a controlled pinball machine. But he first must learn some
25 electronics.

1 Q Well, at page 1393, you testified you had an under-
2 standing concerning the level of ordinary -- I think is what
3 is meant, -- skill in the pinball art prior to 1975, correct?

4 A I do not recall the precise words that I --

5 (Brief interruption)

6 A Yes.

7 BY MR. LYNCH:

8 Q On the next page you answered, "Based on the testimony
9 of Mr. Clark"?

10 A Yes, sir. And what I was not certain of is whether you
11 were asking about Mr. Clark himself or the people he was
12 talking about in his testimony.

13 Q I did not ask. Mr. Schnayer asked.

14 A No, sir. In the question you just asked me, you used
15 Mr. Clark's name.

16 Q Well, based on the testimony of Mr. Clark then?

17 A He was testifying about other people in the art.

18 Q Would you say that the ordinary person in the pinball
19 art prior to 1975, the ordinary person about whom you have
20 testified here, whether that ordinary person would have been
21 able to appreciate all the inherent and all the implied and
22 all the inferred aspects that you have testified about in
23 connection with the '441 patent?

24 A By the word, ordinary person in the pinball art, you
25 must qualify that. As described by Mr. Clark, these were

1 people who were not -- who do not have a digital logic back-
2 ground in computer programming. And in that situation, they
3 would not be able to read about microcomputers and micro-
4 processors without some prior work.

5 Q So then it is fair to say that the '441 patent is not
6 directed to Mr. Clark or to the people about whom he testi-
7 fied, correct?

8 A It is fair to say that for those who have no digital
9 logic background or electronic background or computer pro-
10 gramming background.

11 Q Similarly, it is not directed to a man who only has
12 digital background, electronic background, but no computer
13 background, correct?

14 A That is not so true. At that point in time, the typical
15 digital logic designer in '72, let's use that year, did not
16 have much computer background at all.

17 But that is the time of the introduction of the
18 microprocessor, and they were acquiring it rapidly through
19 the kinds of short courses, vendor supply courses, that I
20 described previously in my testimony.

21 Once one of those men had acquired a knowledge
22 of, for example, the 4004 microprocessor and programming,
23 then this patent would have been quite readable by him, and
24 he would have been able to understand how to build a micro-
25 computer controlled pinball machine following Frederiksen's

1 and Nutting's specifications.

2 Q Yes, but that was a person who both had digital random
3 logic experience and had exposure to microprocessors,
4 correct?

5 A When the understanding would come to such a person,
6 he would have to understand the microcomputer in order to
7 build the device.

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Schoeffler - cross

1 Q And in order to read the patent, correct?

2 A He must also understand English, because that's what
3 the patent is written in.

4 But the patent includes the program, so he
5 clearly must go and study the microcomputer 4004 manual so
6 he understands the computer, so he can literally read the
7 language itself.

8 But then he can understand it with no
9 problem at all.

10 Q So then the person of skill to whom this '441 patent is
11 directed is a person who has digital random logic design
12 experience, correct?

13 A Is that the end of your question, sir?

14 Q No, but he must have that, must he not?

15 A He must understand electronics in general, digital logic,
16 that is correct.

17 Q And he must be able to understand, have a basic working
18 knowledge of microprocessors, correct?

19 A He must be willing to acquire that in the process of
20 reading the patent, that is correct, sir.

21 He must also have a manual so he can look up
22 terms and things of this nature.

23 But the digital logic designer certainly had
24 that capability of doing that. It's just that prior to '72
25 they weren't accustomed to doing that.

This was a new technology which was sweeping in very, very rapidly, and everyone was talking about it revolutionizing the field.

And so these people would then go to these courses, they would learn this, and then he could read the patent and build it.

Q But before he finishes the patent, he has to understand microprocessors, have a basic working knowledge of it, correct?

A He must understand what a microprocessor is, of course.

The invention involves a microprocessor-controlled pinball game. He at least has to know what the word means and what its impact is.

Q All right. Now, you also indicated, Doctor, when you were talking about the constraints on Mr. Frederiksen, that he had to operate within the constraints that pinball designers had previously operated within. Correct?

A I don't recall my exact testimony.

But I believe I was referring to the constraint that he not be able to go into the machine and change the basic hardware, such as the quality of the switches that the ball hits, or other devices like that.

And that he had to design using essentially the same inexpensive, unreliable components that were used in the past.

Q Do you know if they're using the same quality switches

Schoeffler - cross

31 today in pinball machines, or, as of the time that pinball
 2 reached its heyday, microprocessor pinball reached its heyday,
 3 do you know if they were using the same types of switches as
 4 they were using in the old electromechanical games?

5 A I do not, sir. I was basing that on Frederiksen's
 6 testimony.

7 Q And that was most relevant, because at the
 8 time he was inventing this invention, he clearly was using
 9 the same switches because he took a standard electromechanical
 10 pinball game and converted it.

11 A And so that was the constraint that led to
 12 his -- that he lived with in making his invention.

13 Q Do you know whether or not Bally and all the other pin-
 14 ball manufacturers, when they went to microprocessor-control-
 15 led pinball, used the same kind of switches?

16 A I do not know that of my own knowledge.

17 Q Do you know whether they went to gold-plated switches?

18 A I do not know that.

19 Q Why would someone go to a gold-plated switch,

20 Dr. Schoeffler, as a fact, is it not, the pinball --

21 A Gold-plated -- gold -- were used, the pinball industry

22 Q With gold-plated contacts. Not the whole switch.

23 A Gold-plated contacts are used in environments that are
 24 corrosive and where the switch has to conduct very small
 25 current.

Schoeffler - cross

1 Q And so do you know whether Bally in fact uses gold-
2 plated switches?

3 A In their later machines?

4 Q Yes.

5 A No, sir, I do not.

6 Q Do you know whether Gottlieb did?

7 A I have no idea, sir.

8 Q Do you know whether Williams did?

9 A I have no idea, sir.

10 Q Did you read the manuals?

11 A I read the manuals, but I paid no attention to that, if
12 it's there.

13 Q I show you the Cleopatra manual, Exhibit 10-C of defen-
14 dants.

15 Read the warning in bold type on page 11.

16 A "Do not file, burnish or in any way abrade gold-plated
17 switch contacts."

18 I did not consider it significant to the
19 invention, sir.

20 Q Well, it is a fact, is it not, that the pinball -- if
21 indeed gold-plated switches were used, the pinball industry
22 adapted itself in that respect at least to microprocessors,
23 did it not?

24 A Once an invention like this has been produced and shown
25 to be economical, one would expect lots of things.

Schoeffler - cross

And we know there was a dramatic change in this industry in the switching over from the electromechanical to the electronic. And so one would have expected lots to happen.

At the time of the invention one is not certain in advance before it is successful, you know, whether it's going to be successful, whether the economic margin is going to be such that you can improve the components and the like.

Frederiksen very carefully and clearly testified that he did not know. And what he wanted to do is take an existing electromechanical pinball game and demonstrate that you could use a microprocessor to control it. And he did that very successfully and very elegantly.

As time went on and the technology changed, evolutions like that are exactly what one would expect.

And one would expect today that pinball games might even have television displays on them in addition to the lights and the digits and the lamps.

But that's the normal evolution of technology. tion to the invention that perhaps improved the performance or the life or the maintenance cost.

That's the normal way one uses new technology as one gains experience.

Now, would this, Doctor, have advantage does it all

Q Well, let me ask you this, Doctor, just answer -- if you will answer the question.

A All right.

Q The successful games, it would appear, Doctor, all had gold-plated switches on them.

Now, if the successful games had gold-plated switches on them, what did the pinball designers seek to solve as a problem by using gold-plated switches?

A I don't know of my own knowledge that all successful pinball games have gold-plated switches, nor do I know precisely what problem they were solving.

Q So you don't know if the implementation of Flicker is, in that particular aspect, the implementation that was successful and that, as you put it, revolutionized the industry, do you?

A Well, I know Flicker ran for ten years, and so that operated correctly.

If other enhancements were added to the switches for some reason, I do not, actually do not know of my own knowledge what that is or why it is; that is simply an addition to the invention that perhaps improved the performance or the life or cut the maintenance cost.

That's the normal way one uses new technology as one gains experience.

Q Now, tell me this, Doctor: What advantage does it give

1 the electronics engineer to use gold-plated switches instead
2 of the switches that Mr. Frederiksen used?

3 A The only one I know of is when the switch is conducting
4 very low currents, to cut down arcing problems and the like.

5 And so I do not know what the advantage is in
6 the pinball game.

7 Q Arcing is noise, right?

8 A No. Arcing is a discharge of electricity through the
9 air, and when it occurs it can produce noise. It is not
10 noise itself.

11 Q Okay. Arcing -- gold-plated switches also will prevent
12 corrosion of switch contacts, correct?

13 A In general, especially in different atmospheres one
14 uses higher quality metals to prevent corrosion, that is
15 correct, sir.

16 Q And corrosion is one thing that leads to stuck switches,
17 correct?

18 A That is correct, sir.

19 Q So gold-plated switches would also tend to -- tend less
20 to stick than ordinary switches, wouldn't they?

21 A All other things being equal, that is true.

22 And for that reason I would have expected, if
23 that's the reason they went to them, that they would have
24 appeared in the electromechanical games, where there was a
25 much more severe switching of currents through those relays.

1 A And so that's why I do not know of my own know-
2 ledge why later on. It could be simply that the cost of
3 such switches came down, okay, and they would have been used
4 earlier. Yes, sir. I'm sorry. Yes, I do recall now.

5 Q I have no idea what the reason is. I'm just
6 conjecturing. A little bit more special, doesn't it?

7 Q Well, has the cost of gold come down, in your know-
8 ledge, Doctor? From a few things that Mr. Froedaxen used.

9 A I said the cost of gold switches.

10 Q You also testified about infringement, Dr. Schoeffler.

11 A Yes, sir. And you came to the conclusion that

12 Q If I may, to keep all these things in mind: you tes-
13 tified from Exhibit 419, didn't you, which was an accumu-
14 lation of material about the Gottlieb machines, the Cleopatra
15 and Spiderman, correct? to keep in mind what we have here.

16 A That is correct, sir. Where I'd like to compare the

17 MR. LYNCH: Do we have a copy of 419 for the
18 Doctor, please. Yes, sir, and Spiderman as a last item.

19 BY MR. LYNCH: Now, insofar as you're concerned, Doctor, do you

20 Q Referring once again to the item of the gold-plated
21 switches, you also distinguished the calculator art; you
22 said the calculator art really had nothing to do with the
23 pinball art, because they use special keys.

24 Q I understand. Do you remember, do you recall that testimony,
25 Doctor? Yes, sir. I never make a detailed comparison?

1 A Not precisely, sir.

2 Q Well, you differentiated between calculator keys and
3 pinball playfield switches.

4 A Oh, yes, sir. I'm sorry. Yes, I do recall now.

5 Q The use of gold-plated switches makes the switches on
6 the playfield a little bit more special, doesn't it?

7 A It makes them different.

8 Q Different from the things that Mr. Frederiksen used.

9 A Yes, sir.

10 Q Okay. Doctor, you testified about the Cleopatra and
11 the Spiderman game, and you came to the conclusion that
12 both infringed the patent.

13 A On a claim-by-claim basis I found claims that read on
14 both of those machines, that is correct, sir.

15 Q Now, I would like to keep in mind what we have here.
16 I'm going to make a chart where I'd like to compare the
17 Flicker game on the one hand, the '441 patent on the other,
18 Cleopatra on the other, and Spiderman as a last item.

19 Now, insofar as you're concerned, Doctor, do you
20 regard Flicker substantially the same as the '441 patent, or
21 do you know?

22 A It's my opinion that the '441 patent, as you call it,
23 reads on Flicker.

24 Q I understand that. Let's talk about the detailed cir-
25 cuitries: did you ever make a detailed comparison?

1 A The substance is the same.

2 Q Let me call another thing to your attention, just as
3 a matter of interest.

4 In this device, the decoder that operates the
5 solenoids is shown operating the ...

6 A The optoisolator.

7 Q -- the optoisolator that works the coin acceptance.

8 A That is correct, sir.

9 time

10 A No, sir.

11 The way these optoisolators work, that if you hit
12 them periodically, they stay warm for a time which is very
13 long compared to the closure time of solenoids.

14 And you'll notice that in the patent where
15 Frederixen disclosed that idea, that he has that in the
16 bottom line of that top decoder, which is the rest position.

17 In other words, when nothing else is being done,
18 he's constantly maintaining or hitting that optoisolator to
19 keep it hot.

20 So in my opinion there would be no problem with
21 using that. But I have the impression that it was not used
22 in the Flicker game. I don't know why.

23 That's not the way it was implemented in the Flicker
24 game.

25 A That's my impression.

3,1

1 Q Do you know if that is the way it works on Flicker?

2 A I do not believe that's the way it works on Flicker, but
3 I did not trace the wires to be sure.

4 Q And in fact, if this were the way it worked, the way it
5 works on Flicker, you wouldn't be able to take coins at any
6 time that the solinoids were being activated?

7 A No, that's not true, sir.

8 Q Well, if they were being activated for any period of
9 time.

10 A No, sir.

11 The way those optoisolators work, that if you hit
12 them periodically, they stay warm for a time which is very
13 long compared to the closure time of solenoids.

14 And you'll notice that in the patent where
15 Frederiksen disclosed that idea, that he has that in the
16 bottom line of that top decoder, which is the rest position.

17 In other words, when nothing else is being done,
18 he's constantly bombarding or hitting that optoisolator to
19 keep it hot.

20 So in my opinion there would be no problem with
21 using that. But I have the impression that it was not used
22 in the Flicker game. I don't know why.

23 Q That's not the way it was implemented in the Flicker
24 game.

25 A That's my impression.

1 Q Let's go to what we're talking about as comparing these
2 devices.

3 The Flicker game itself -- the first thing I want
4 to talk about is whether it has a single matrix.

5 Q Does the Flicker game have a single matrix?

6 A It's my belief it has a single matrix, sir.

7 Q Does the '441 Patent disclose a single matrix?

8 A In the preferred embodiment it discloses it. But it
9 also calls for multiple matrices.

10 Q Well, it never says that. Now we're getting inherent,
11 again, right, Doctor?

12 A No, sir.

13 The initial reference to matrix multiplexing, it
14 clearly does not exclude multiple matrices. And then it goes
15 on to a specific case where there is one.

16 The claims further, when the claim, for example,
17 Claim 46 refers to a single matrix, it is a narrowing of
18 Claim 5 which does not. And so multiple matrices are clearly
19 called for in the '441 Patent.

20 So I would not agree with a "yes" there.

21 Q I'm not saying what it excludes. I'm saying what it
22 shows, the circuitry it shows.

23 A The preferred embodiment in that figure shows a single
24 matrix. The patent teaches multiple matrices.

25 Q It never explicitly teaches it. It only doesn't exclude

1 it. Correct? Just so we understand each other, Doctor.

2 A. It explicitly teaches it in the claims by claim
3 differentiation, if that's the proper term, between 45 and 46.
4 That's the only way to read those, and so that is explicit.

5 Q. We can get to claim differentiation later.

6 A. All right.

7 Q. Answer this question, Doctor: Does it ever say explicit-
8 ly "You may use more than one matrix"?

9 A. The patent doesn't use words like that for anything, sir.

10 A. But it does not specifically anywhere use the exact
11 words that you have just quoted.

12 Q. It never suggests explicitly 2 matrices, does it?

13 A. On the contrary. Because of that introductory part, it
14 indicates in the preferred -- it does not exclude them.

15 Then in the preferred embodiment, the justification
16 for the single matrix is rather carefully established.

17 Notably, because of the limitations of the 4,004, the ability
18 to, for example, time offset can be done this way, whereas it
19 would be more awkward or at least different if multiple
20 matrices were there.

21 They are not excluded.

22 Q. I didn't say they were excluded.

23 It nowhere explicitly says two matrices.

24 A. The words "two matrices" are nowhere explicitly written.

25 Q. Let's talk about the disclosure of the '441 patent.

1 A The preferred embodiment?

2 Q Yes.

3 A All right.

4 Q I want to talk about this. (Indicating)

5 A All right. Why don't we label it as such, then, to
6 differentiate it from the patent as a whole.

7 Q "'441 device."

8 A Why don't we say "preferred embodiment."

9 Q "Embodiment." I'll put "Embodiment for '441."

10 A Thank you.

11 A That is correct.

12 Q Directly to the point.

13 A Correct.

14 Q It's a good idea to be specific in stating

15 that's alright.

16 I'm going to ask you to look at the diagram on page 12.

17 sequential steps in the process.

18 I'm going to ask you to look at the diagram on page 12.

19 stance.

20 I'm going to ask you to look at the diagram on page 12.

21 A May I ask you a question, a little bit?

22 Q Yes.

23 A And I'm sorry.

24 Q Yes.

25 I'm going to ask you to look at the diagram on page 12.

- U 1 Q We'll say that a single matrix is disclosed there,
2 correct?
3 A In the preferred embodiment, yes, sir.
4 Q What does Cleo use?
5 A Cleopatra uses two matrices, sir, one for the switches
6 and one for the digital display.
7 Q And the lamps aren't even matrix multiplexed, correct?
8 A The lamps are not matrix multiplexed in Cleopatra, that
9 is correct.
10 Q So we have two matrices, and excluding lamps. Correct?
11 A That is correct, sir.
12 Q Likewise for Spiderman?
13 A Correct.
14 Q I'm just going to draw an arrow over, indicating
15 that's similar for Spiderman.
16 Let's go to the next aspect, that is, cyclic and
17 sequential operation of the switch scan.
18 Let's talk about the switch scan in each in-
19 stance.
20 Q Well, How is the switch scan accomplished in Flicker?
21 A May I move the figure 5 out of the way a little bit?
22 Q I'm sorry.
23 A And would you repeat the question. I'm sorry.
24 Q How is the switch scan in Flicker accomplished?
25 Is it accomplished cyclically and sequentially?

1 A The switch scan is cyclical and sequential.

2 Q And that means that the microprocessor goes through
3 those 16 mux lines and then there's one line at the end, I
4 believe, and then comes back and strobes them again, correct?

5 A That is correct. Cyclical and sequential for switches
6 implies that you do not miss switch closures.

7 And so when you are looking for a switch to
8 close, you have to look at each of the columns over and over
9 and over again.

10 Q And another reason that Mr. Frederiksen testified he
11 kept that in Flicker cyclic and sequential is because he
12 didn't want lamp flicker, correct?

13 A In the single matrix implementation that Frederiksen
14 had, he needed to keep the lamps lit on an even basis so
15 that they would not flicker, and so that they would all be
16 of uniform brightness, also.

17 And so since the switches are in the same
18 matrix, the scanning most of the time is the same, but not
19 all the time.

20 Q Well, he discloses cyclic and sequential scanning.

21 When is it not cyclic and sequential?

22 A Whenever in the Flicker game that he is going out and
23 doing a routine that is long in computation, all right, so
24 that for example he is away from the multiplexing routine,
25 he goes back and periodically does a multiplexing column,

1 but that does not include the reading of the switches.

2 Q And that's the period we talked about at the end after
3 he goes through all sixteen columns, correct? He has one
4 period at the end --

5 A The long routines are all done when he does that. But
6 during that time he does insure that the lamps stay lit,
7 properly and that the test -- I'm sorry. I mis-spoke.
8 The test line of course is tested during that time.

9 Q So he has to make it cyclic and sequential to be sure
10 he doesn't miss switches and to be sure the lamps stay of
11 the same brightness and don't flicker, correct?

12 A That's correct, sir. To scan the switches, it does

13 Q That is likewise the case in the embodiment of the
14 '441, correct? For example, immediately after a switch closure.

15 A That is correct, sir. switch, and then it goes off and

16 Q Now, how about Cleopatra, how is the switch scan accom-
17 plished in Cleopatra? as there's a switch closure in Cleo-

18 A Cleopatra and Spiderman differ in a significant way,
19 or in the following way from Flicker, which reflects on that:
20 namely, the use of an -- Let me back up. I'm sorry. constri-

21 tion, that The switches in Cleopatra are organized into an
22 8, a set of 8 columns instead of, as in Frederiksen's 16.

23 And they are scanned cyclically and sequentially.

24 Q Now, they're scanned cyclically and sequentially when
25 no one is playing the game, right? as we continue the scan

A Whenever one -- whenever Cleopatra is looking for a closed switch, it constantly scans cyclically and sequentially. That's while someone is playing the game, it does that also.

Q Well, your testimony on this, I believe, Dr. Schoeffler -- I believe you testified that while it's strobing, it's strobing cyclically and sequentially; but when it's out doing other things, it interrupts that strobe. Correct?

A When it is out doing other things?

Q When it is keeping score, when it is doing other things.

A When there is no need to scan the switches, it does not, that is correct.

For example, immediately after a switch closure, you have to respond to that switch, and then it goes off and does another routine. That is correct, sir.

Q Now, let's assume there's a switch closure in Cleopatra. Okay?

A Yes.

Q And let's assume we're using 11-E, just for demonstration, that switch 22 in 11-E closes.

A Yes, sir.

Q And we come and see that.

A Yes, sir.

Q What happens in Cleopatra? Do we continue the scan?

1 A We go off and process that switch. And then when
2 we're through with that, we re-start the scan, the next
3 time we scan.

4 Q We start where?

5 A At the beginning of the matrix again.

6 Q You start at the beginning of the matrix again.

7 A That is correct, sir.

8 you have, page 10, line 10, "I was a person who was
9 familiar with the person who was a person who was
10 familiar with the person who was a person who was that correct?"

11 A That's correct.

12 Q Now, when you say "I was a person who was"

13 A Let me finish the sentence.

14 (Reading from the transcript)

15 "I was a person who was a person who was a person who was"

16 Q Now, when you say "I was a person who was"

17 "I was a person who was a person who was a person who was that all the
18 time I was a person who was a person who was a person who was"

19 "I was a person who was a person who was a person who was because
20 of the fact that I was a person who was a person who was a person who was"

21 "I was a person who was a person who was a person who was a person who was"

22 "I was a person who was a person who was a person who was a person who was"

23 "I was a person who was a person who was a person who was a person who was"

24 "I was a person who was a person who was a person who was a person who was"

25 "I was a person who was a person who was a person who was a person who was"

ct, si

1 Q Now, that would mean that in Cleopatra, the way it is
2 arranged, it's possible that we will never get to switch 23,
3 correct?

4 A No, sir.

5 Q Well, I would like to ask you to refer to Mr. Harmer's
6 testimony on the issue.

7 Mr. Harmer's testimony is in 419, the exhibit
8 you have, pages 136 and 137 of his testimony.

9 Now, Mr. Harmer was a Rockwell engineer who was
10 familiar with the design of Cleopatra. Isn't that correct?

11 A That's correct.

12 Q Now, Mr. Katz asked the question --

13 A Let me finish the page, if I may.

14 (Reading document) ... a degree so that it will work
15 practically. I'm sorry. I finished it now, sir.

16 Q Mr. Katz asked the question:
17 "How is it possible then to be sure that all the
18 play field switches" -- and it means on Cleopatra --
19 "which are required to be sensed will be sensed because
20 of the theoretical possibility that a switch scan might
21 not be completed?"

22 Answer on the next page: I don't see that that is

23 "THE WITNESS: There is no guarantee of not
24 missing switches in any number of situations."

25 Did you read that?

1 A Yes, I did.

2 Q Do you believe that?

3 A I believe he must have known what he was talking
4 about, and so I accept that, sir..

5 Q So there could be situations where indeed you miss
6 switches in Cleopatra, because you don't finish a scan.
7 Correct?

8 A There are situations where that may occur now and then,
9 that's correct, sir. He said so.

10 Q Now, that would mean that one of the purposes of the
11 cyclic and sequential operation of Frederiksen is not ful-
12 filled by Cleopatra. Correct?

13 A In the design of the control system for a pinball
14 machine, one reduces it to a degree so that it will work for
15 practically.

16 If Cleopatra was missing switches every second,
17 you would not be able to play the game.

18 If, now and then, because of some fast action of
19 the ball, a switch were missed, it probably would not be
20 noticed.

21 If it were noticeable, it would not have been a
22 successful game, in my opinion. So I don't see that that is
23 a difficulty.

24 Q Well, I just want to talk about the designer's philo-
25 sophy here.

1 A Yes, sir.

2 Q The operation of Cleopatra is interrupted, and not
3 cyclic and sequential. Isn't that fair to say?

4 A No, sir.
5 I would call the scanning in Cleopatra cyclical
6 and sequential.

7 Almost all -- recall that when the ball is moving
8 around the playing field, 99 per cent of the time the ball
9 is not in contact with anything. When it hits a switch, it's
10 in contact with it for a few milliseconds; we pick it up,
11 respond to it, and then we're looking again.
12 So almost all the time it is cyclically and
13 sequentially scanning.

14 Now, when something happens so that we know, for
15 example, it is unlikely for another switch to be closed,
16 because I've just detected this switch to be closed, there's
17 usually no need even to scan the switches.

18 Or, if I'm deliberately turning off the scanning
19 because I know I would misread it.

20 And that does not violate the spirit or the de-
21 scription that Frederiksen gave in the patent, namely, you
22 cyclically and sequentially scan so you don't miss switch
23 closures.

24 Q But you just read testimony where there was no guaran-
25 tee in the Cleopatra that you wouldn't miss switch closures.

1 A There is no guarantee in any machine that you will not
2 miss switch closures.

3 Q Your testimony then is, is that Cleopatra is cyclic
4 and sequential, as you testified on page 1251, most of the
5 time, scanning through, finding no switches are closed.
6 Correct?

7 A That is correct, sir.

8 Q Now, we had a discussion early on that cyclic and
9 sequential, does it mean anything to add "sequential" on
10 to "cyclic"?

11 A It means quite a bit in the specific embodiment de-
12 scribed in the patent, because the switch and the lamp matrix
13 are together, and so one is constrained in the way you scan
14 the switch columns by the need to keep the lamps the same
15 brightness.

16 So, yes, sir, the word cyclical means a set of
17 events which recur; the cyclical in the patent refers to the
18 fact that you have to do them in order so the lamps are all
19 the same brightness.

20 That would not, incidentally, be the same con-
21 straint once we move the switch matrix out of the lamp
22 matrix.

23 Q So Cleo doesn't have the lamps in a matrix, so the
24 second reason to have a cyclic and sequential scan, that is,
25 to keep the lamps of uniform brightness and to keep them
from flickering, wouldn't be present in Cleo. Correct?

1 A That is not correct, sir.

2 The lamps are irrelevant here. The things that
3 are matrix multiplexed are digits, and those have to be
4 cyclical and sequential so that they stay the right bright-
5 ness.

6 Q Now, I understand. But the lamps you don't have to worry
7 about.

8 A The lamps are not matrix multiplexed in Cleo, in
9 Cleopatra, that is correct. If we go through the matrix
10 in Cleopatra and we strobe it and are interrupted and go back
11 to the beginning, is that cyclic?

12 A The scanning of that switch matrix is cyclic and
13 sequential.

14 Q It's cyclic and sequential even though we go back to the
15 beginning every time we detect a switch closure?

16 A Now and then that happens. A very small percentage of
17 the time.

18 And when it happens we are in a situation where
19 usually we know we do not have to scan.

20 So the inversion does not have to carry the connec-
21 tion, that, for example, in a time interval when no switch
22 can be closed that you must scan just to make the
23 lamp turn on or anything like that.

24 He inverted it so he would not miss closed switches.
25 And so that's the real meaning of that requirement is the

1 Q So you don't have to worry about them.

2 A The designer had to make sure the lamps were turned on
3 properly, so he worried about them that that design was
4 proper.

5 A You must worry about them from a noise point of
6 view. You do not have to worry about them from a cyclical
7 and sequential matrix multiplexing point of view, because
8 they're not multiplexed.

9 Q Now, my question is this: If we go through the matrix
10 in Cleopatra and we strobe it and are interrupted and go back
11 to the beginning, is that cyclic?

12 A The scanning of that switch matrix is cyclic and
13 sequential.

14 Q It's cyclic and sequential even though we go back to the
15 beginning every time we detect a switch closure?

16 A Now and then that happens. A very small percentage of
17 the time.

18 A And when it happens we are in a situation where
19 usually we know we do not have to scan.

20 A So the invention does not have to carry the conno-
21 tation that, for example, in a time interval when no switch
22 can be closed, that you must still scan just to make the
23 invention valid or anything like that.

24 A He invented it so he would not miss closed switches.
25 And so that's the real meaning of that requirement in the

1 claims.

2 Q How many balls are there on the Flicker playfield?

3 A There are 3.

4 Q Can there be simultaneous switch closures?

5 A There can be simultaneous switch closures, that is
6 correct, sir.

7 Q With the Cleopatra arrangement you could miss those
8 simultaneous switch closures, or very close together switch
9 closures, because we have 3 balls in the playfield, correct?

10 A That's problematical. It depends on how long the scan
11 takes to complete the full 16 columns, sir.

12 Q I understand that. But we're talking about, you said you can't have
13 switch closures very close in time one to the other; I point
14 out to you, with 3 balls in the playfield, you can.

15 A Yes, sir.

16 Q Isn't that correct?

17 A That's correct, sir.

18 Q And if in Cleopatra one ball trips 22, and we are going
19 back processing and beginning at the beginning, and a ball
20 trips 23, you could miss the 23 switch. Isn't that correct?

21 A I would have to check. Does Cleopatra have multiple
22 balls, sir?

23 Q I don't know.

24 A Neither do I, sir.

1 Q We're talking about the design of Cleopatra as applied
2 to a number of machines.

3 A Yes, sir.

4 Q Do you know about those machines?

5 A Yes, sir.

6 Q Let's talk about the design of Cleopatra as a 2-ball
7 game. Could it miss switches?

8 A If the -- without knowing anything more about it,
9 because you do not scan, if a switch were to close at just
10 the wrong time, you could miss it, as Harmer said.

11 But, of course, recall that the designer of the
12 Cleopatra game would put those switches in the matrix, I
13 assume, in such a way that that would not be a problem.
14 Otherwise it would not be a commercial game., in order to
15 read that So apparently it was not a problem in the games
16 that were designed. substantially equivalent to it.

17 Q Is it your parameter that if it's a successful game
18 it infringes?

19 A No, sir.

20 Q You will agree that the cyclic and sequential operation
21 of Cleopatra and Spiderman is -- or, Cleopatra, is not the
22 same as the cyclic type of operation of Flicker or the cyclic
23 type of operation that was shown in the patent, right?

24 A I don't agree with that at all, sir. It, the Cleo,

25 I think it's carrying out substantially the same

1 function, substantially the same way, with identical results.

2 Q You're giving me a substantially. I'm asking you, is
3 it the same as what's done in Flicker?

4 A If you are referring to, does my reading of the claim
5 on Cleopatra, the way I read that claim because of the --

6 MR. SCHNAYER: Mr. Lynch, you're interrupting his answer.

7 BY THE WITNESS:

8 A When I take a claim like 45 and read it on Cleopatra,
9 I look at the language in the claims. And that language is
10 means plus function language.

11 In order to understand that I go to the specifica-
12 tion and look to see what means are disclosed to carry out
13 those functions.

14 And then in the infringing machine, in order to
15 read that claim literally on it, I have to find those claims
16 or something that is substantially equivalent to it.

17 This is substantially equivalent to it, and hence
18 it reads literally.

19 And so it is present in the Cleopatra machine the
20 way I understand the reading of the claims for infringement.

21 BY MR. LYNCH:

22 Q I don't want you to talk about claims. I want you to
23 talk about machines.

24 And you've answered my question. It, the Cleo,
25 is not the same operation.

Q The You might regard it as equivalent; we'll get to that later. Flicker machine is not done in Cleopatra.

A You are saying that when the switch is closed, it restarts the scan as the Flicker machine?

A It is a different microprocessor, it is -- everything is different about -- what do you mean by the same operation? Where the same effect occurs. Namely, whenever an event occurs which causes Flicker to perform one of those longer routines, and then it goes out and hits the multiplexing routine several times so it can keep the lamps and the digits bright, the switches are not being scanned. And hence there are columns also being skipped in the Flicker game under rare circumstances.

These occur very rarely and do not affect the operation of the game.

I see no difference whatsoever in that statement.

Q You see no difference at all?

A I do not, between what is actually implemented in the Flicker game and what Cleopatra does.

Q But you said what Cleo does is equivalent, but there's no difference. Is that your testimony?

A No.

What I said was, if I'm reading the claim, it is substantially the same.

What I said was, the way the columns of the matrix

ation

1 Q The cyclic and sequential operation as done in the
2 Flicker machine is not done in Cleopatra.

3 A You are basing that question on the fact that when a
4 switch is closed, detected closed, it restarts the scan at
5 the beginning, is my understanding.

6 Q And there are situations in the Flicker program
7 where the same effect occurs. Namely, whenever an event
8 occurs which causes Flicker to perform one of these longer
9 routines, and then it goes out and hits the multiplexing
10 routine several times so it can keep the lamps and the digits
11 bright, the switches are not being scanned. And hence there
12 are columns also being skipped in the Flicker game under rare
13 circumstances.

14 A They These occur very rarely and do not affect the
15 operation of the game.
16 Q I see no difference whatsoever in that strategy.

17 Q You see no difference at all?

18 A I do not, between what is actually implemented in the
19 Flicker game and what Cleopatra does.

20 Q But you said what Cleo does is equivalent, but there's
21 no difference. Is that your testimony?

22 A No.
23 Q What I said was, if I'm reading the claim, it is
24 substantially the same.

25 A Yes, What I said was, the way the columns of the matrix

are scanned are no different, in general, in specific instances in the 2 games. That is, in Flicker also columns of switches are skipped now and then.

Q Let's go to the lamp scan, Doctor.

A Yes, sir.

Q Cyclically and sequentially strobe the lamps, correct?

A That is correct, sir.

Q Likewise in the '441 embodiment, correct?

A That is correct, sir.

Q What happens in Cleo?

A Lamps are direct driven.

Q They are not cyclically and sequentially operated, correct?

A They are not matrix multiplexed, so they would not be -- it's not appropriate to talk about cyclical and sequential at all, except from the self-cleaning point of view, which is carried out in the background program.

Q Let's talk about Spiderman. Does that operate likewise?

A Spiderman is also direct driven, the lamps, yes, sir.

Q So neither are matrix multiplexed.

Let's go to the digits.

Well, let me ask you something about the lamp scan, now, Doctor: You mentioned something about zero crossings occurring in Cleo.

A Yes, sir. I made an error in my testimony when I

discussed that.

Q. You made an error in your testimony.

A. Yes. I was not thinking properly and made an error.

Q. There is no zero crossing detector.

A. No, sir, I do not believe there is.

Q. There's no zero crossing detector in Spiderman.

A. That's correct, sir.

And I indicated that for both machines.

Q. You indicated that zero crossing exist in both machines, didn't you?

A. Yes. I was discussing the noise prevention immunity considerations of the game, and mixed it up with another game.

Q. And so all your testimony that talked about the noise prevention immunity from turning on lamps and sequencing lamps and all that, all of that testimony about how Spiderman and Cleo achieved that by zero crossing detectors is not the case with respect to those devices, correct?

A. The only testimony I gave about zero crossing with respect to Cleo and Spiderman was to list it among the noise prevention techniques.

My actual discussion of zero crossing was with respect to the Bally Freedom Game, sir.

Q. You indicated specifically, "The lamps, which are not matrix multiplexed" -- this is Page 1257 and 1258 -- "The

4
1 lamps which are not matrix multiplexed are directly turned on,
2 but at the zero crossing point of the supply line."

3 A I did say that.

4 Q "So that again we have low noise generated when we turn
5 on the lamps".

6 A I did say that, sir, and that was incorrect.

7 And there's one more comment about Spiderman that's
8 identical to that one about 2 pages further in my testimony.

9 Q It's a little bit further than that.

10 A All right.

11 Q All right, let's talk about the solenoids.

12 A Yes sir.

13 Q How are the solenoids operated in Flicker?

14 A The solenoids in Flicker are direct driven, sir.

15 Q They're direct driven through a decoder, correct?

16 A They are direct driven, there's a decoder in the circuit,
17 that's correct, sir.

18 Q And they're operated by the CPU, correct?

19 A Yes, sir. Most of them are, sir, not all of them.

20 Q Which ones are not?

21 A The flipper, the solenoid that closes the flipper is
22 direct driven, sir.

23 Q Well, it's direct driven, but it's activated according
24 to the patent through an optoisolator, isn't it?

25 A That merely enables the flippers so that when someone is

1 not playing the game and there's no coin in it, you can't
2 sit there and cause them to operate. ers wouldn't work.

3 A But at the instant you press the switch in, the
4 switch is in series with the solenoid right here, and as
5 long as the game is permitting you to push the buttons, they
6 close, without the microprocessor using the decoder or any
7 circuitry to close that. not yet testified a great deal about

8 Q Well, if the microprocessor doesn't refresh the opto-
9 isolator, they'll stop being driven, correct?

10 A That is correct, sir.

11 Q So if the microprocessor forgets about it, they won't
12 be driven, correct?

13 A If it forgets about it, sir? me, Mr. Lynch. I think

14 Q Yes, if it doesn't strobe the optoisolator and energize
15 it.

16 A But it does in the program.

17 BY THE WITNESS;

18 A I lost my train of thought. Let me think just a second

19 AS. SCHWABER: Maybe we could have the question--

20 BY THE WITNESS;

21 A No, sir, I didn't testify that. Because the solenoids
22 are constantly on while other things are going on.

23 What is not done is that while we're in the
24 middle of a lock or and sequentially going through the array
25 we do not turn on or off solenoids at that time.

am. 1 Q I understand that. But if something were to happen
2 where that wouldn't occur, the flippers wouldn't work.

3 A If the optoisolator failed, for example, that would
4 be a failure for the machine.

5 Q Or if that strobe line were cut.

6 A Or if that strobe line were cut, yes, sir.

7 Q Now, in that respect you testified a great deal about
8 how in the Flicker machine the solenoids were operated at a
9 time that nothing else was going on.

10 A That is correct, sir.

11 Q Can the flippers be operated at a time when nothing
12 else is going on?

13 MR. SCHNAYER: Excuse me, Mr. Lynch. I think
14 you cut off his answer, and he was trying -- I object.

15 THE COURT: Go ahead, Doctor. If you weren't
16 finished, go ahead.

17 BY THE WITNESS:

18 A I lost my train of thought. Let me think just a second.

19 MR. SCHNAYER: Maybe we could have the question--

20 BY THE WITNESS:

21 A No, sir, I didn't testify that. Because the solenoids
22 are constantly on while other things are going on.

23 What is not done is that while we're in the
24 middle of cyclically and sequentially going through the array,
25 we do not turn on or off solenoids at that time.

But once on, they are, through that decoder circuit, because these are AC driven solenoids, they're constantly being hit to operate.

BY MR. LYNCH:

Q I understand.

But so we understand, you spoke about each cycle and you said, "During part of the cycle that you're looking at switches, you don't operate solenoids, so there won't be noise."

And that was a noise-immunity technique of Flicker. Correct?

A That is correct, sir.

Q Now, what about the flippers, can the flippers be operated while you're scanning switches?

A The flippers are not controlled by the machine, and so the processor -- they are totally asynchronous with respect to anything going on in the computer program.

They can be operated at any time.

Q So in the Flicker machine, that noise immunity technique, there's an exception made for the flippers in Flicker?

A Out of all the solenoids those two are not run that way, that is correct, sir.

Q Now, they're AC solenoids, correct?

A That is correct, sir.

Q In the embodiment shown in the '441 patent they are

1 also shown as being driven by the CPU, but I don't know if it
2 tells you whether they're AC or not.

3 Does the diagram tell you whether they're AC
4 solenoids or not?

5 A Yes, sir. It says AC right there.

6 Q Fine. So in both instances in the Flicker game, and
7 in the embodiment shown in the '441 patent, we have solenoids
8 driven by the CPU that are AC solenoids, correct?

9 A That is correct, sir.

10 Q Now, and except for the flippers, those are sequenced
11 in time so that the noise will not interfere with switch
12 scanning, correct?

13 A That's the cart before the horse.

14 A The program sequences itself in time so it will
15 not have to do things at a noisy time.

16 You must turn on the solenoids when the appro-
17 priate event occurs, and then you offset from that things
18 that you can do at an arbitrary time so you're not interfered
19 with.

20 Q Now, you also indicated that the operation of solenoids
21 put a real time constraint on the system, correct?

22 A I did -- if the -- if you are, for example, trying to
23 hit a ball away from the bumper, that is a real time response
24 constraint.

25 Q The pot bumper.

1 A The pot bumper, the slingshots.

2 Q The slingshots.

3 Now, let's take Cleo. How are the solenoids
4 operated in Cleo?

5 A Some of the solenoids are operated by the micro-
6 processor; others are direct driven, as are the flipper
7 solenoids.

8 Q Now, let's take the solenoids that are direct driven.

9 How are the pot bumper solenoids driven on
10 Cleopatra?

11 A They are direct driven.

12 Q So there's no real time constraint with the micro-
13 processor design for the pot bumpers, correct?

14 A That's not true, sir.

15 You still have to detect the switch closure,
16 because there's a score effect, and so there is a signaling
17 switch on the pot bumper, and so you must still read that
18 switch in time to light the digits and the lamps, and so
19 forth. That is a real time constraint.

20

21

22

23

24

25

1 b1

Schoeffler - cross

1 Q You do not have to respond to the --

2 The microprocessor does not have to respond to
3 the pot bumper while the ball is on, correct?

4 A The time you have to respond to that is dependent on the
5 time it takes to light the corresponding score and all that,
6 and that would be up to the game designer to determine that
7 time interval. It would not be an awful lot different, but it
8 might be different, but it need not be a lot different.

9 Q Well, so the Court understands, on Cleo, the pot bumpers
10 and the great majority of solenoids are run basically the same
11 way they are run on the electromechanical Flicker game,
12 correct? they driven by the CPU?

13 A That is correct, sir. The only exception to that is
14 they are enabled as a group, I believe, are they not, by the
15 microprocessor.

16 The pot ball I would have to check my recollection and see
17 the diagram. pot bumper solenoid, and it is not direct drive.

18 Q I wish you would. called in response to the ball hitting.

19 A Okay. I had questioned whether it was enabled or not,
20 and I (Brief interruption.) here which shows some kind of

21 BY MR. LYNCH: ce.

22 Q Other than the fact that the whole game is enabled by
23 the microprocessor? turns it on or off.

24 MR. SCHNAYER: Excuse me, Mr. Lynch. Isn't he
25 referring to his notes or something?

Schoeffler - cross

THE WITNESS: But that is exactly what I am --

THE COURT: Excuse me for just a minute.

(Brief interruption.)

THE COURT: Thank you.

Let's take a ten-minute recess.

MR. LYNCH: Thank you.

(Brief recess.)

MR. LYNCH: I believe, your Honor, there was a question outstanding to Dr. Schoeffler about the solenoids in Cleo. That is correct, sir.

BY MR. LYNCH: There are also DC solenoids in those parts, are

Q Are they driven by the CPU?

A Some of the solenoids are driven by the CPU.

Q Does DC? I believe your question was referring to the flipper solenoids. Of view, Dr. Schoeffler?

Q The pot bumper? alternatives for noise prevention that

A Or the pot bumper solenoid, and it is not direct driven by the CPU. I had indicated in response to the ball hitting the bumper. I had questioned whether it was enabled or not, and I referred to a diagram here which shows some kind of an enabling device.

What I have here is insufficient to determine whether the computer turns it on or off.

It is not germane to the invention nor to the infringement, however.

Schoeffler - cross

Q So can we say about the solenoids in Cleo and Spider, some are driven by CPU and some not?

A Yes, sir.

Q Those that are not driven work substantially like an electromechanical game, don't they?

A That is correct.

Q The real time constraints as far as hitting a ball away from those solenoids is as in an electromechanical game, correct?

A That is correct, sir.

Q Now, there are also DC solenoids in those games, are there not?

A That is correct, sir.

Q Does DC solenoids -- do DC solenoids prevent advantages from a noise point of view, Dr. Schoeffler?

A They allow some alternatives for noise prevention that is economical in those games; namely the steering diode across the solenoid for turn-off noise.

Q Displays as opposed to the lamps.

A To be consistent with the way I have testified, I have used display for both. So it might be wise to just indicate digit.

Q Digit except?

A That is correct, sir.

Q That is -- in the embodiment of the '441 patent?

Q They do not have the problem of surging currents running through them, alternating currents, correct?

A Even with an AC solenoid, when you turn it on, the turn-on is gradual because it is an inductor. It is turn-off that is the problem in the AC solenoid.

A Yes, sir. The sizes of the currents are comparable in AC or DC.

Q Suffice it to say that the AC solenoids prevent or present more noise problems, isn't that correct?

A Yes, That is fair, sir.

Q Let's talk about the displays.

Q The displays in the Flicker game are cyclically and sequentially driven, right?

A If you don't mind, sir, thank you.

A Yes, sir. Are you talking about both lamps and digits, sir?

Q Display scan. No, the digits as opposed to the lamps.

A Oh, all right.

Q Displays as opposed to the lamps.

A To be consistent with the way I have testified, I have used display for both. So it might be wise to just indicate digit.

Q Digit scan?

A That is correct, sir.

Q That is true in the embodiment of the '441 patent?

2
1 A. That is correct.

2 Q. What do they use in Cleo?

3 A. They use a cyclical and sequential scan.

4 Q. What is the apparatus used in Cleo?

5 Do you remember GPKD?

6 A. Yes, sir.

7 Q. What is a GPKD?

8 A. The GPKD is a chip supplied as part of the vendor chip
9 set in which the portion of the running of the cyclic and
10 sequential column enabling of the digits is done, sir.

11 Q. Now, do you remember what GPKD stands for,
12 Dr. Schoeffler?

13 A. Yes. That stands for general purpose keyboard display.

14 Q. The general utility of this chip was what?

15 A. For calculators.

16 Q. To run a display of a calculator, correct?

17 A. No, sir, to run the keyboard and the display of a
18 calculator.

19 Q. To run in part the display of a calculator?

20 A. Well, to cost-justify a chip like that, then the vendor
21 is selling it into a low cost unit like a calculator, and
22 it was intended for both the keyboard and the display clearly.

23 Q. I understand that, but in a calculator, it runs a
24 seven-segment display the same as the LED displays on Flicker,
25 correct?

1 A The displays in a calculator are not the same as the
2 displays in Flicker because of power level remoteness, con-
3 current operation of switches, remote sensing, and all the
4 other complexities in the pinball game.

5 Q You previously testified that in the real time con-
6 straints of the invention of the '441 patent as recorded in
7 19-H that you strobe the lamps fast enough to appear continu-
8 ous, and you strobe the displays likewise. Do you remember
9 that testimony?

10 A Well, that discussion was with respect to a large, quote,
11 calculator, and I do not really agree with what I ended up
12 saying there.

13 Q But the thing is is that the displays on Flicker operate
14 the same way as smaller displays on a calculator, the seven-
15 segment displays, correct?

16 A Not quite. The displays have other things that a
17 calculator would not have like the noise-prevention hardware,
18 the slow turn-on transistors, and things like this that you
19 would not have.

20 They are there because of all the other things
21 going on at the same time in the pinball machine. So they are
22 not the same.

23 The computer program looks different. The
24 sequencing looks different, and the like.

25 The only thing that is the same is that the

Schoeffler - cross

1 digits are made up of seven segments, and you hit them ^{are}
 2 periodically, but there is so much else that is different.
 3 That is the dominant part.

6-3 4 Q The digits are the same, types of digits, that are used
 5 in calculators, correct?

6 A Are you talking physically, or are you talking appearance
 7 or what? I am not sure what you mean.

8 Q They are seven segment digits, is that it?

9 A The digits on many of these calculators are seven segment
 10 display digits.

11 Q The chip that is used on the calculator digits is
 12 the same chip that is sold by the same company to drive
 13 eight displays on calculators, correct?

14 A The portion of the chip that is used to drive the
 15 column strobes is separated by a physical line.

16 Q And the 7446 chip is a chip that is sold by Rockwell
 17 Co. in part, some and illuminated segments on
 18 calculators, correct?

19 A Well, it usually does, but it is not a function. That
 20 requires some power circuitry.

21 It goes over the segments and the segments
 22 in response to the values of the segments and then to
 23 display and normally also address the segments of the calcula-
 24 tor keyboard, also.

25 Q I just want to talk about the segments of it.

1 Q The display digits, the digits, are the same. We are
2 talking about a digit scan here, correct?

3 A That is correct, sir.

4 Q The digits are the same, types of digits, that are used
5 in calculators, correct?

6 A Are you talking physically, or are you talking appearance
7 or what? I am not sure what you mean.

8 Q They are seven segment digits, correct?

9 A The digits on many of these machines are seven segment
10 display digits.

11 Q The chip that is used on Cleo to drive the digits is
12 the same chip that is sold by the Rockwell Company to drive
13 digit displays on calculators, correct?

14 A The portion of the chip that is used to create the
15 column strobes is generated by the GPKD chip.

16 Q And the GPKD chip is a chip that is sold by Rockwell
17 to, in part, scan and illuminate 7-segment displays on
18 calculators, correct?

19 A Well, it actually does not do the illumination. That
20 requires some power circuitry.

21 It generates the column strobes and the segments
22 in response to the values of the digits that you wish to
23 display and normally also scans the switches on the calcul-
24 ator keyboard, also.

25 Q I just want to talk about the display part of it.

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1 It does, in fact, operate the displays on
2 calculators, correct?

3 A It is part of the operation of the displays. It can be
4 used for that on calculators and is used or was used.

5 Q Now, we have here a switch scan, a lamp scan, and a digit
6 scan, correct, in Cleo?

7 A The lamps are direct driven. The only scanning of them
8 would be self-cleaning.

9 Q We have a switch scan and a digit scan?

10 A That is correct.

11 Q Are they done synchronously?

12 A No, sir, they are not as best I could determine from the
13 available material.

14 Q They are not done synchronously?

15 A As best I could determine, I could not determine that
16 they were synchronized.

17 Q Neither are they the same matrix or are they synchronous?

18 A That is correct, sir. That is why I could not read

19 "claim 46 on Cleopatra."

20 Q Now, with respect to Spiderman, how is the digit display
21 operated?

22 A The digit display on Spiderman is -- they are done
23 cyclically and sequentially, if I may use that term. It
24 does not use a GPKD chip. It uses a normal chip that is
25 part of that particular vendor's chip set called the RIOT.

1 Q The RIOT chip?

2 A The RIOT chip.

3 So each one is using the gender -- the vendor
4 specific chip.

5 Q That RIOT chip, do you know if it is otherwise used for
6 similar type display activation and control?

7 A The RIOT chip, if we may use that abbreviation, is a
8 general purpose input/output chip, so that anyone who uses
9 the 6502 microprocessor uses that for everything. That is
10 for getting data into the microprocessor or sending signals
11 out of the microprocessor.

12 Q Now, we also talked about a number of other items in
13 the Flicker and the other devices, noise, et cetera, type of
14 aspects of the design.

15 The first of which I would like to ask you about,
16 Doctor, are the use of optoisolators.

17 Now, you talked about that as a noise immunity
18 technique in Flicker, correct?

19 A I called it a noise prevention technique because it is
20 a hardware --

21 Noise prevention technique?

22 A -- technique.

23 Q That exists in Flicker, correct?

24 A That is correct, sir.

25 What is a turn-on time? Did you measure it?

1 Q It exists in the '441 patent embodiment, correct?

2 A Yes, sir.

3 Q Does it exist in Cleo or in Spiderman?

4 A No, sir.

5 Q Secondly, low beta or slow turn-on transistors, these
6 are present in Flicker, correct?

7 A That is correct, sir.

8 Q Is it present in the '441 patent embodiment?

9 A Yes, sir.

10 Q Is it present in Cleo or Spiderman?

11 A The cold lamp current is limited in those games in
12 exactly the same way as it is in the Flicker game, sir.

13 Q By what component, Doctor?

14 A It is not limited by the zero crossing as you
15 previously testified?

16 A Right.

17 (Brief interruption.)

18 THE WITNESS: In the Gottlieb Cleopatra game, on
19 the -- I am looking at the diagram that is labeled "Master
20 Driver" -- my copy does not have an exhibit number on it --
21 but the lamps are driven by a transistor with a resistor at
22 the base, and that combination of that resistor and transis-
23 tor and the applied voltage controls the currents through
24 the lamps.

25 Q What is the turn-on time? Did you measure it in

Schoeffler - cross

1 Cleo?

2 A I did not measure anything in Cleopatra.

3 The limiting of the cold current size has
4 nothing to do with the slow turn-on transistor that is in the
5 Flicker.

6 Q Oh. Well, does the Cleo use the low beta or slow turn-
7 on transistor concept that is present in Flicker in the '441
8 patent?

9 A The low beta transistor and the slow turn-on transistor
10 concept are two different concepts for two different purposes.

11 Q Let's take the low beta transistor concept first then.

12 A The purpose of the low beta transistor is to limit the
13 cold current in the lamps.

14 Q Does such a low beta transistor exist in Cleo or Spider-
15 man?

16 A The combination of the resistor and transistor produces
17 the same limiting current in Cleopatra and Spiderman, sir.

18 Q The same limiting current. Could you explain that,
19 Doctor?

20 A The objective of cold lamp current limiting is to limit
21 the surge of current that enters the lamp when you turn it on
22 when it is first cold.

23 So the size of the current is controlled, in
24 this case, by a particular transistor and its associated game,
25 whereas in contrast, Frederiksen uses a transistor which he

1 called a low beta transistor because he used a Darlington be-
2 cause he was driving an entire row of transistors of lamps
3 like this, whereas in the Cleopatra and Spiderman, because
4 they are direct driven, a separate transistor is used for each.
5 But it produces substantially the same function substantially
6 the same way and exactly the same result.

7 Q Let me examine you about that.

8 The Flicker and the embodiment of the '441
9 patent light the lamps 1/16th of the time, correct?

10 A That is correct, sir.

11 Q The lamps in Cleo and Spiderman are activated 100 percent
12 of the time they are on, correct?

13 A During the interval when they are on, they stay on
14 continuously. That is what is meant by direct driven,
15 not multiplexed.

16 Q There is a great deal more problem in limiting the
17 current surges in the Flicker and the embodiment of the '441
18 patent, isn't that correct?

19 A I would not call it a greater problem. There is a
20 greater need because of the potential for more noise, but the
21 technique that is used to limit it is equally applicable in
22 the two cases with equal ease.

23 Q You say that there is a transistor with a resistor that
24 is used here that is equivalent?

25 A That is correct, sir.

Q Now, do you know what effect that, in fact, has or what the design purpose of that transistor and resistor was?

A I know nothing about who designed this or why they designed it.

Q However, in examining the result, it is clear from the schematic that this carries out this function. Why or who is beyond my personal knowledge.

A The slow turn-on transistor is present in the Flicker because the switches and the lamps are in the same columns of the matrix, and you are trying to prevent the lamp surge from hurting the switches.

None of that is applicable here.

Q Now, insofar as noise is concerned, did you notice whether or not the Cleo and Spiderman were grounded?

A Yes. I looked in the cabinet.

Just to be sure --

(Brief interruption)

BY THE WITNESS:

A (Continuing) In the Cleopatra machine, I found no grounding or shielding in the base cabinet, but I found shielding in the back cabinet.

BY MR. LUNCH:

Q Shielding. How about grounding?

A Yes. There is a ground strap. I did not see it here.

ldge 1 Q Let's talk about a slow turn-on transistor.

2 A That is present in the Flicker and the embodi-
3 ment of the '441 patent, correct?

4 A That is correct, sir. ~~correct, yes.~~

5 Q Is it present in Cleo or Spiderman? ~~of the '442 patent~~

6 A It is -- there is -- since Cleo and Spiderman do not
7 matrix multiplex the lamps, there is no place to put such a
8 transistor, and it is not present. ~~processor in the back cabi-~~

9 ~~net.~~ The slow turn-on transistor is present in the
10 Flicker because the switches and the lamps are in the same
11 columns of the matrix, and you are trying to prevent the
12 lamp surge from hurting the switches.

13 Q None of that is applicable here.

14 Q Now, insofar as noise is concerned, did you notice
15 whether or not the Cleo and Spiderman were grounded? ~~my answer~~

16 A Yes. I looked in the cabinet.

17 A Just to be sure --

18 (Brief interruption) ~~'441 patent substantially~~

19 BY THE WITNESS:

20 A (Continuing) In the Cleopatra machine, I found no
21 grounding or shielding in the base cabinet, but I found shield-
22 ing in the back cabinet. ~~It is a resistor capacitor network,~~

23 BY MR. LYNCH: ~~is two components arranged in a way~~

24 Q Shielding. How about grounding? ~~the high frequencies~~

25 A Yes. There is a ground strap. I did not see it here

1 in my notes.

2 Q Both the Cleopatra and the Spiderman use grounding
3 techniques, correct?

4 A Yes, sir, in the back cabinet, yes.

5 Q Neither Flicker nor the embodiment of the '441 patent
6 disclose that, do they?

7 A Neither disclose that explicitly, sir, no.

8 Q Now, shielding of the microprocessor in the back cabi-
9 net, is that shown in Flicker?

10 A No, sir.

11 Q Is it disclosed in the '441 patent?

12 A No, sir.

13 Q Is that done in Cleo and Spiderman?

14 A Yes, sir.

15 Q How about RC networks to prevent noise? Are they shown
16 on the Flicker game?

17 A No, sir.

18 Q Are they shown in the '441 patent embodiment?

19 A No, sir.

20 Q Are they present in Cleo or Spiderman?

21 THE COURT: Tell me again what an RC network is.

22 MR. LYNCH: It is a resistor capacitor network,

23 shown your Honor. It is two components arranged in a way

24 that it more or less filters out the high frequencies

25 or low frequencies, depending on what you would like

1816

1 to do. in one that are not...
2 BY THE WITNESS: re are, of course, not... as the

3 A There are some RC networks shown on the Cleopatra
4 diagram. different.

5 BY MR. LYNCH: it is different.

6 Q Are you satisfied they exist in Spiderman as well?

7 A I believe so. that as to...

8 Q Now, this is the comparison of the devices and the
9 way the result of a pinball machine is achieved, correct?

10 A That is a comparison of some very specific items. when
11 you read... As we started this whole chart, we indicated we
12 were not attempting to read the claim on it. So I do not
13 accept this comparison as being relevant to the reading of
14 the claims on Cleopatra and Spiderman, however.

15 Q I understand that. first time

16 Let us talk about the devices themselves. They
17 differ. The embodiment of Flicker, the embodiment of the
18 '441, and the embodiment of Cleo and Spiderman differ as
19 summarized on this chart? as you go to reading patent claims

20 A It is clear that Cleopatra and Spiderman differ.

21 A Yes. Incidentally, Flicker and the embodiment in '441
22 are almost identical, if not identical. At least as is
23 shown on this chart, I believe they are identical, in fact.

24 So they do not differ, but they differ only in-
25 sofar as some very specific elements that you selected are

1817

1 listed in one that are not in the other.

2 A There are, of course, other things like the
3 picture on the game that is different, and many other things.
4 that are different.

5 Q The paint is different?

6 A The paint is different, also.

7 Q Do you regard that as material?

8 A No, but the question of significance of the difference
9 when reading the claims is important.

10 Q Now, you talked about reading the claims and said when
11 you read claims, this is what you do.

12 When is the first time in your life you read
13 claims on devices, patent claims?

14 A Patent claims, last August.

15 Q Last August was the first time.

16 Prior to that time you had no understanding of
17 reading a patent claim on anything, did you?

18 A That is correct, sir.

19 Q Now, last August when you began reading patent claims
20 on something, did someone tell you how to do it?

21 A Yes, sir.

22 I pointed out the independent claim, and what I
23 have you as my client.

24 Now, the language that you are talking about is the
25 language that you have used throughout this trial of

1
sir

1 Q Who?

2 A Mostly Mr. Schnayer and Mr. Katz worked with me to teach
3 me how I should carry out my infringement studies.

4 Q Did anyone else work with you to tell you how to carry
5 out your infringement studies?

6 A I cannot recall anyone else other than in meetings
7 where there might be a third person, but the essential
8 discussions of how to read the patent claims, I learned from
9 those, as far as I recall.

10 Q You never had a discussion with anyone else on how a
11 claim might be interpreted or how you might read the claims
12 of the '441 patent on the various devices used there?

13 A The only exception was one evening I talked to Professor
14 Kayton for a few moments, who was helping me to understand the
15 patent terminology and the language.

16 Q He was helping you to tell you how you might read these
17 claims on the devices?

18 A No, sir. I think, is the ability of those I applied
19 them to, What they were teaching me how to do was how to
20 carry out the infringement study and use the proper language
21 and the like.

22 I carried out the infringement study, and what I
23 gave you is my opinion.

24 Q Now, the language that you are talking about is the
25 language that you have used throughout this trial of

1 substantially the same means, operating in substantially the
2 same way to achieve substantially the same results, correct?

3 A: All of the language associated with the means plus
4 function elements in the claim, that is correct, sir.

5 Q: They told you that you should use that language, correct?

6 A: They emphasized that it was necessary to be precise and
7 explained the language and what it meant, and I have attempted
8 to use it in a precise way.

9 Q: Now, other than reading the claims of the '441 patent,
10 on Cleopatra and Spiderman and Disco Fever and Flash and
11 Batman, have you ever read the patent, the claims of any
12 patent, on any other device?

13 A: I have read the claims of the '441 Nutting/Frederiksen
14 patent on the Flicker machine, on the embodiment disclosed in
15 the patent, and on the Fireball and the Freedom.

16 I attempted to do it on the Atarian and did not
17 infringe on that game.

18 That, I think, is the totality of games I applied
19 them to, sir.

20 Q: So have you ever read any other patents on other devices?

21 A: I have read patents, but I have not had to do infringe-
22 ment studies.

23 Q: So the totality of your experience in reading claims on
24 devices comes in reading the '441 patent on the various
25 devices you have indicated you read it on here, correct?

1 A: That is correct, sir.

2 Q Now, you have also discussed this theory or principle
3 or something of claim differentiation, correct?

4 A Yes, sir.

5 Q When did you first hear of the theory or principle
6 of claim differentiation?

7 A Sometime between last August and now when I was attempting
8 to understand the relationship on successive claims that in-
9 cluded other claims. This was explained to me what this
10 terminology meant and what its implications were.

11 Q Part of this education process that you were put through was
12 by Mr. Katz, Mr. Schnayer, and others in connection with
13 preparing you for your infringement studies, correct?

14 A: That is correct, sir.

15 Q Now, in that study, I believe you indicated that when
16 you looked at the Atarian, you did not even look at the
17 various noise prevention techniques in that device at all,
18 correct?

19 A No, sir, because the prerequisite for infringement is
20 matrix multiplexing of the switches. So I looked for that
21 first, and it was not even present. So there was no need to
22 go further in my mind.

23 Q As you testified previously, in the Atarian, the process-
24 or multiplexes the switches, scans them; that is, with a
25 time division multiplexing technique, but they are not

1 arranged in a matrix, correct?

2 A. That is correct, sir.

3 Q. You read Claim 1 as requiring a matrix?

4 A. That is my opinion, sir.

5 Q. You also read Claim 45?

6 A. Claim 45 is what we are looking at, that is correct, sir.

7 Q. Now, in that reading of Claim 45, I had marked up a copy
8 of Claim 45 as 19(e)(1) and (2). You indicated, I believe, that
9 sub-paragraph (e) as it appears on this exhibit, Defendants'
10 Exhibit 19(e)(1), which provides for a plurality of response
11 means, et cetera, inherently includes stuck switch error
12 recovery, correct?

13 A. May I see the next page, too, sir, so we can see the
14 whole thing?

15 (Brief interruption.)

16 THE WITNESS: Okay. Claim 45 includes a number of
17 different elements which lead to the need for matrix multi-
18 plexing which is operative, and to understand what that means
19 -- and it uses means plus function language.

20 In order to understand what that means, we go to
21 the -- we go to the specification to determine precisely what
22 function is disclosed or what means is disclosed to carry out
23 that function; namely, operative matrix multiplexing.

24 As a result of that, it is clear that real time
25 response and error recovery is required, and that includes,

1 as a consequence, the stuck switch error problem.

2 Q Fine.

3 Now, when we are making these comparisons, when
4 you looked at the Atarian, you did not look at how they
5 handled stuck switches? you.

6 A I did not look at it. I do not believe that I had the
7 materials even to look at at any rate. However, it was
8 irrelevant to infringement because they are not arranged
9 in a matrix. means operatively connected, et cetera -- that
10 those words find a response in the Atari device, just the
11 words in it?

12 A I do not know what you mean by the words.

13 Q The Atari device has a multiplexing means operatively
14 connected to the processor, doesn't it?

15 A That is means plus function language.

16 The only way I know how to read that is to go back
17 to the specification and see what it means, and that says
18 matrix multiplexed. There is no question about that is
19 the specification.

20 Q I understood that.

21 A So it does not appear in the Atarian because the switches
22 are not in a matrix.

23 Let's not believe I am not reading a claim, Locust.

24 Let's not believe I am reading words.

25 Does the Atarian have a multiplexing means?

trix

1 Q Now, we did go through the fact that if we look at the
2 words of (g), the words of part (g) --

3 A Would you mind pulling that out just about 6 inches?

4 (Brief interruption.)

5 THE WITNESS: Thank you. That is correct.

6 BY MR. LYNCH: As we have said you before, August a multiplexing

7 Q The words of Part (g), without more; that is, the
8 recitation in part (g) of Claim 45 at 19(e)(2), having a
9 multiplexing means operatively connected, et cetera -- that
10 those words find a response in the Atari device, just the
11 words in (g)? asked for clarification.

12 A I do not know what you mean by the words. Atari has

13 Q The Atari device has a multiplexing means operatively
14 connected to the processor, doesn't it? the Atari is

15 A That is means plus function language. start?

16 A I did The only way I know how to read that is to go back
17 to the specification and see what it means, and that says
18 matrix multiplexing. There is no question about that in
19 the specification. able and proper continuation of noise

20 Q I understand that. unity, et cetera, et cetera, and

21 A So it does not appear in the Atarian because the switches
22 are not in a matrix. to these noise immunity techniques.

23 Q Let's make believe I am not reading a claim, Doctor.

24 Let's make believe I am reading words.

25 Does the Atarian have a multiplexing means? as

1 A. To read the word, I need to know the understanding of the
2 word. The reason I was so hesitant about those lines on the

3 is If you want to define multiplexing as being non-
4 matrix multiplexing, then the switches in the Atarian do have
5 a non-matrix multiplexing scheme, that is correct. or is it?

6 Q. If I were to have told you before August a multiplexing
7 means, you would have said yes, that is a multiplexing means,
8 wouldn't you? or is it?

9 A. No. I would have been slightly wondering what you mean
10 because there are lots of different multiplexing means, and
11 I would have asked for clarification. is it intended environment?

12 Q. That would have been one of them, what the Atarian has?

13 A. That is one of very many, yes. RC networks, that is not

14 Q. Now, that means whatever it is in the Atarian is
15 operatively connected to the processor, correct? that

16 A. I did not pursue it to determine that it was operatively
17 connected to the processor because that carries the conno-
18 tation then of the real time response. It carries the
19 connotation of suitable and proper combination of noise
20 prevention and noise immunity, et cetera, et cetera, and I
21 stopped when it was clear that it was not infringing.

22 Q. Now, let's go down to these noise immunity techniques,
23 the use of RC networks, shielding, grounding, those items
24 there. is that each one of them be in or that on a one-to-one
25 basis that Doctor, are those items items that you regard as

1 equivalent of the techniques disclosed in the '441 patent?

2 A. The reason I was so hesitant about those lines on the
3 chart is that misses the whole point of the noise prevention
4 and noise immunity. It is not a situation where we are
5 looking for individual elements like optoisolators or low beta
6 transistors or double reading of switches and the like.

7 It is that the operative matrix multiplexing,
8 which is the key in (g), and something like Claim 45
9 requires that there be the proper combination of hardware
10 prevention techniques and software noise immunity techniques,
11 so that the machine will operate in its intended environment
12 in a practical manner.

13 So whether or not you use RC networks, that is not
14 required.

15 Whether you have low beta transistors, that
16 specific one is not required.

17 What is required, all right, is that you have a
18 combination of hardware noise prevention techniques and
19 software noise immunity techniques that working together,
20 okay, with the computer program and the matrix multiplexing,
21 give you the adequate operation.

22 Now, in fact, most of the infringing machines
23 include many of the ones in the Flicker, but it is not
24 necessary that each one of them be in or that on a one-to-one
25 basis that you define them to be equivalent.

1 THE COURT: Are you saying that any combination, any
2 successful combination, of parts would infringe --

3 THE WITNESS: No, sir.

4 THE COURT: -- whether or not they are shown in the
5 specifications of the '441 patent?

6 THE WITNESS: No, sir.

7 What I am trying to say is that the invention,
8 of course, is microprocessor control of a pinball game
9 and using operative matrix multiplexing.

10 Now, in that means plus function language, when
11 I go to the specification and say what does -- what are the
12 operative matrix multiplexing means disclosed, what I find out
13 is there is a philosophy for how to put this thing together
14 there.

15 What we try to show is that combination is
16 the combination of the matrix, and some of the hardware tech-
17 niques allow you to do things in software, okay, that if you
18 did not do it in software, would make for very extensive
19 hardware.

20 So it is the net combination of parts that
21 makes it operative.

22 Whether any one particular one is there or
23 not, okay. In my view, is not relevant because each of these
24 machines has a different structure, and the technology keeps
25 changing with time.

Now does that approach square with

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there 1 THE COURT: Well, is it the philosophy?

2 THE WITNESS: It is the combination, that is
3 exactly it. It is not just devices.

4 THE COURT: Combination of what?

5 THE WITNESS: All right, it is the combination of
6 hardware devices to do noise prevention.

7 THE COURT: But are they particular devices?

8 THE WITNESS: Not particular devices.

9 THE COURT: Generic?

10 THE WITNESS: Generic devices, and in the combina-
11 tion with the software techniques. Recall, in that program
12 we tried to emphasize that in this routine, you double read
13 the switches, and in this routine that you offset in time.

14 What we try to show in that combination is
15 the combination of the matrix, and some of the hardware tech-
16 niques allow you to do things in software, okay, that if you
17 did not do it in software, would make for very extensive
18 hardware.

19 So it is the net combination of means that
20 makes it operative.

21 Whether any one particular one is there or
22 not, okay, in my view, is not relevant because each of these
23 machines has a different structure, and the technology keeps
24 changing with time.

25 THE COURT: How does that approach square with

your view that you look to the specifications to determine the meaning of the claims in this combination means plus function patent?

THE WITNESS: Well, when I go to the specification, it is clear in my mind that I see these matrices, and you need matrix multiplexing. That is the heart of the invention, all right.

THE COURT: Why do you say that is the heart rather than something else being the heart?

THE WITNESS: Oh, because throughout the specification, from beginning to end, it is clear in the special embodiment and all discussions about it that everything centers around the use of matrix multiplexing.

Then along with that, he keeps talking about slow turn-on transistors and low beta transistors and the like, altogether with the matrix and that organization, to set it up, so that the software can carry it out.

In contrast, if you went back to before the microprocessor and looked at the way these things were done, very expensive hardware systems were used. What was new and innovative in this use of the microprocessor in the pinball machine was the recognition that we no longer do everything in hardware. We can do lots of things in the program now to make it effective and to make it work, but they have got to be chosen, not just so you have 14 hardware things and 3

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software. You have got to choose the hardware structure and that software structure so they work together like hand in glove to carry out that real time application.

THE COURT: Would anyone have been able to devise a pinball machine utilizing matrix multiplexing and not infringe '441; that is to say, is there any combination of elements that would include matrix multiplexing that would not infringe?

THE WITNESS: If you did not matrix multiplex the switches, it would not be covered by the claims. So if you matrix multiplex the digits and the lamps but not the switches, it would not violate the claims that we are reading.

However, I think the problem includes the noise prevention and noise immunity successful combination. When people started trying to apply this microprocessor, it was not clear how, and you could think of lots of ways to do it.

What Frederiksen did was come up with this combination that worked.

Now, if we look at the infringing machines, we see that almost all of the things he did are also done in those infringing machines. So, in fact, they are almost the same techniques being used.

But, in general, as the technology changes, we have a different microprocessor this year. We do things

4
1 differently.

2 For example, Frederiksen used a single matrix
3 in his machine. That is because he was using that 4004
4 microprocessor of that era.

5 As soon as the eight-bit microprocessors
6 became available, it was much more effective to go, in my
7 opinion, to separate matrices. But you are still applying
8 the heart of the invention. You are still applying the
9 matrix multiplexing. You have got to live with the noisy
10 environment of a pinball machine. It is absolutely an
11 essential, and you cannot afford to put in real expensive
12 noise-prevention techniques.
13 So you select from the available economic
14 ones and apply computer programmer software so they work
15 together to do it operatively.

16 THE COURT: If you have answered my question, I
17 am not sure I have understood the answer.

18 Are you saying that if you are successful in
19 diminishing noise to an acceptable level and you use matrix
20 multiplexing of switches, then regardless of what other
21 devices and apparatus you have used to achieve that result,
22 you have infringed?

23 THE WITNESS: It requires both switches in some of
24 the displays to be --

25 THE COURT: Which displays?

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THE WITNESS: Either the lamps or the digits or both.

THE COURT: Why do you say that?

THE WITNESS: Claim 45 explicitly lists the displays.

But I am saying that if you have a micro-processor control pinball game and you matrix multiplex the switches and you matrix multiplex some of the displays and you can make it operative in its intended environment, so it has got adequate real-- what we call real time response, adequate recovery, that means that the noise has been prevented probably by a combination of hardware and software, and it infringes the claim read-on.

THE COURT: All right, thank you.

That is all included in the claim in the word, operatively, correct?

No, sir. I used that statement before, it was sort of a shorthand.

If we go through the elements starting on the previous page, it actually appears in several places, and the word, "operatively," as we previously indicated, appears in several places.

You have to read the claim as a whole. But what it says is that we must end up with operative matrix multiplexed of a microprocessor controlled pinball game, and

1 BY MR. LYNCH: [unclear] that function involved an [unclear]

2 Q [unclear] Let me just supplement this chart. [unclear] a [unclear]

3 [unclear] I left off line filters as a noise prevention
4 technique. That is not present in Flicker or the embodiment
5 of the '441, is it? [unclear] it, in [unclear] there is a [unclear]

6 A [unclear] That is correct, sir. [unclear] the multiplexing means [unclear]

7 Q [unclear] Both Cleo and Spiderman use it, don't they?

8 A [unclear] There is a line filter in each, that is correct, sir.

9 Q [unclear] Now, in connection with --

10 [unclear] Now, what you discussed with the Court a moment
11 ago about how one would utilize noise prevention, noise im-
12 munity, and all this to make a successful game, correct?

13 A [unclear] That is correct, along with the matrix multiplexing,
14 et cetera. [unclear] multi [unclear] means is, in effect, the [unclear]

15 Q [unclear] That is all included in the claim in the word, oper-
16 atively, correct?

17 A [unclear] No, sir. [unclear] When I used that statement before, it was
18 sort of a shorthand. [unclear] and sequentially enabling
19 [unclear] If we go through the elements starting on the
20 previous page, it actually appears in several places, and
21 the word, "operatively," as we previously indicated, appears
22 in several places.

23 [unclear] The [unclear] You have to read the claim as a whole. [unclear] But what
24 it says is that we must end up with operative matrix multi-
25 plexing of a microprocessor controlled pinball game, and

1 the means to carry out that function involved an adequate
2 or proper combination of hardware noise prevention and soft-
3 ware noise immunity is precisely what I testified.

4 Q Now, let's go to the claim.

5 Just so we understand it, in (g) there is a multi-
6 plexing means. What, in fact, is the multiplexing means in
7 Flicker or the '441 patent?

8 A The multiplexing means includes the matrix, which in-
9 cludes the switches, digits.

10 You did say Flicker, did you not, sir? I am sorry.

11 Q Yes.

12 A It is the matrix and its associated circuitry to cyclic-
13 ally and sequentially scan that matrix.

14 Q So the multiplexing means is, in effect, the decoder,
15 in Flicker?

16 A No, sir.

17 Q The multiplexing means that is operatively connected
18 to the processor for cyclically and sequentially enabling
19 the signaling means --

20 Now, the signaling means are the switches, right?

21 A The signaling means are the switches and their associ-
22 ated circuitry.

23 Q The multiplexing means is separate from the signaling
24 means, correct?

25 A The multiplexing means includes the matrix, the drive

1 at the top, the slow turn-on transistors, et cetera. You
2 really cannot read this thing a word at a time and decode
3 each word -- I am lost -- because it's multiplexing means
4 operatively connected to the processor.

5 A Yes. This includes your decoder at the top in the
6 Flicker for generating what are called the mux drive sig-
7 nals on that schematic and then the slow turn-on transistors
8 and the remainder. Through all your 95 claims but not as
9 thoroughly as I have attempted to do 45, et cetera.

10 Q Do you know if all of the claims require multiplexing
11 in a matrix of both switches and some displays?

12 A It is my understanding that there are some claims
13 that do not.

14 Q Now, given that as a proposition, what is the in-
15 vention, Doctor?

16 Is the invention multiplexing switches? Is the
17 invention multiplexing switches in some displays? Is the
18 invention multiplexing displays alone?

19 A The invention involves microprocessor controlled pin-
20 ball games using matrix multiplexing, okay, that is opera-
21 tive, which means that in its intended environment, the
22 noisy environment, which you have alluded to and other people
23 have alluded to, including myself, that it operates succe-
24 ssfully, with associated real time response where needed and
25 with adequate error recovery. That is the invention.

1 Q Let me ask you this, Doctor.

2 Have you been over all of the claims that were
3 originally charged, that defendants were charged with in-
4 fringing?

5 A Not in detail. I do not know what you were-- what the
6 defendants were originally charged with.

7 Q Well, did you--

8 A I have read through all your 95 claims but not as
9 thoroughly as I have attempted to do 45, et cetera.

10 Q Do you know if all of the claims require multiplexing
11 in a matrix of both switches and some displays?

12 A It is my understanding that there are some claims
13 that do not.

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20 ball games using matrix multiplexing, okay, that is opera-
21 tive, which means that in its intended environment, the
22 noisy environment, which you have alluded to and other people
23 have alluded to, including myself, that it operates success-
24 fully, with associated real time response where needed and
25 with adequate error recovery. That is the invention.

1 When I read Claim 45 on it, that requires matrix
2 multiplexing of the switches in some displays. And I have
3 to look at it on a claim-by-claim basis to interpret it
4 beyond that.

5 Q But given the fact that some claims do not require
6 the multiplexing of both displays and switches, what is the
7 sine qua non of this invention? What is the thing without
8 which we can know we do not infringe?

9 A I can do that only on a claim-by-claim basis. It is
10 clear that Frederiksen was able to successively invent a
11 microprocessor controlled pinball game that was very effec-
12 tive, producing a design that today is probably still the
13 best way to do it, where the only change even today is due
14 to the changing technology of some different kinds of micro-
15 processors.

16 Now, to read infringement, the only way I know
17 how to do it, unfortunately, is on a claim-by-claim basis.

18 If I am given a machine, I think I know how to
19 read the claim on it to determine whether it infringes.

20 Q But you cannot tell me if there is a thing without
21 which I can know I do not infringe this patent?

22 If I have any matrix multiplexing of any switches
23 or any displays, I might be infringing this patent, right?

24 A I would have to go through the claims very carefully,
25 but since only ones that are being called on here are 45

1 through et cetera, why, I have not done that or attempted to
2 do that, nor do I know if that is the proper thing to do.

3 Switched, correct?

4 I believe there is such a claim, but I would want to
5 review it myself before I answered. All right.

6 I know there are other claims that refer to
7 a portion of the system.

8 I would want to study them if that were in
9 issue.

10 and claims that refer to multiplexing of only displays,
11 correct?

12 I believe there is such a claim.

13 Now, for the last question I would like to ask you
14 about these claims -- did you review the file history, that
15 is, the history of prosecution of these claims including
16 what is in the Patent Office?

17 A I did not review the proceedings.

18 I have read so much in this case. I do not
19 know whether I may have perhaps read excerpts from it, but I
20 do not, to my knowledge, review that, which I believe are
21 all those books over there on that table.

22 Did you ever, on any occasion during the proceedings in
23 the '441 case, either originally or through its release
24 agent, who is a designer, released a claim of the type of
25 which you are talking about, that is, based upon prior art

do 1 Q But you are aware of the fact that there are claims
2 in this patent that call for multiplexing of only the
3 switches, correct?

4 A I believe there is such a claim, but I would want to
5 re-read it myself before I answered affirm --

6 I know there are other claims that refer only
7 to a portion of the system.

8 I would want to study them if that were in
9 issue.

10 Q And claims that refer to multiplexing of only displays,
11 correct?

12 A I believe there is such a claim.

13 Q Now, Doctor, the last question I would like to ask you
14 about these claims is did you review the file history; that
15 is, the history of prosecution of these claims including
16 Claim 45 in the Patent Office?

17 A I did not read the proceedings.

18 I have read so much in this case. I do not
19 know whether I may have perhaps read excerpts from it, but I
20 did not, to my knowledge, review that, which I believe are
21 all those books over there on that table.

22 Q Did you encounter any occasion during the prosecution of
23 the '441 patent, either originally or through its reissue
24 stage, where the examiner rejected a claim of the type of
25 45, which does not say the word, matrix, based upon prior art

1 that had multiplexing techniques which involved multiplexing
2 not in a matrix?

3 Did you follow that question?

4 A. Well, I was not involved, and I have never read anything
5 about anything like that to my knowledge.

6 Q. Were you told by Mr. Katz or Mr. Schnayer that the
7 history that these claims went through in the Patent Office
8 could be relevant to what they mean?

9 A. The only discussion I ever recall on that subject was
10 after you raised the question early in my testimony, and they
11 indicated that I did not have to take time out to read them.

12 Q. Did they indicate to you that it might be relevant?

13 A. That was the only reference to it.

14 Q. All right, Doctor, we have the back of the machine open.

15 Could you go over to the machine?

16 THE COURT: Let me ask is this going to be a lengthy
17 line of questioning?

18 MR. LYNCH: No, your Honor. I was hoping that I
19 would be finished today, your Honor.

20 THE COURT: Okay. Well, I would like to recess
21 within a few minutes.

22 MR. LYNCH: When I say lengthy, I mean 10 minutes
23 or 15 minutes, your Honor.

24 THE COURT: Well, I have --

25 MR. LYNCH: I think I can wrap it in that time.

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THE COURT: I think we had better go over then
until tomorrow morning because I have some things to do.

So let's shoot for 9:00 o'clock tomorrow
morning. Is that okay?

MR. LYNCH: We will do that, your Honor.

THE COURT: 9:00 o'clock tomorrow morning.

(Brief interruption.)

THE COURT: Oh, I have got three criminal cases.

Okay, 10:00 o'clock, 10:00 o'clock tomorrow
morning.

MR. SCHNAYER: Thank you, your Honor.

MR. LYNCH: Thank you, your Honor.

(Whereupon an adjournment was taken herein to 10:00 a.m.
of the following day, Thursday, March 15, 1984.)